The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879.

Published Every Other Saturday by

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Volume 25 December 2, 1922 Number 24

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ROCK PRODUCTS strongly believes in associations and in the practical value to members, both individual and company, of association work. It is ROCK PRODUCTS' aim to report faithfully all such conventions, and it is the policy of the editors to attend the conventions personally in order that a more accurate and more complete report may be made.

* * *

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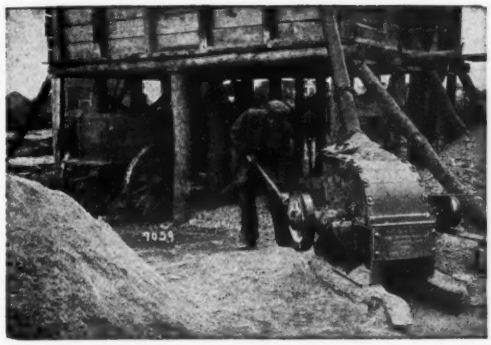
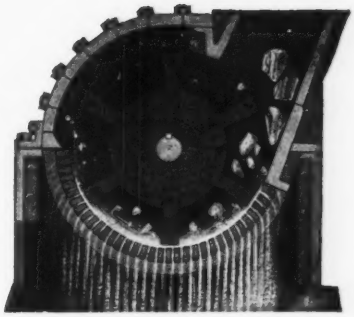


A Typical Road Contractor's Crushing Plant Showing Jeffrey "A" Swing Hammer Pulverizer



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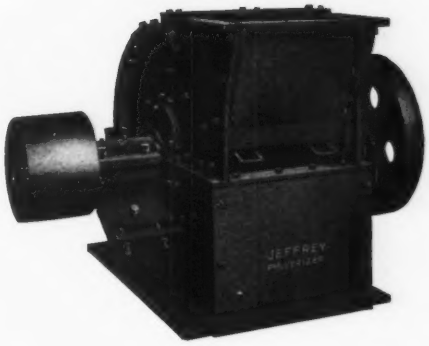

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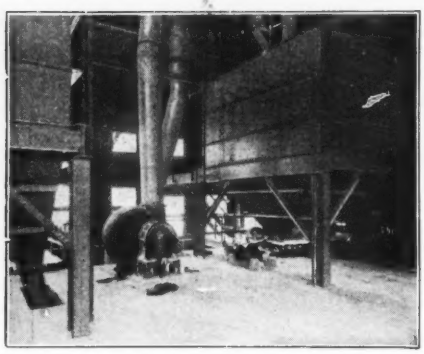

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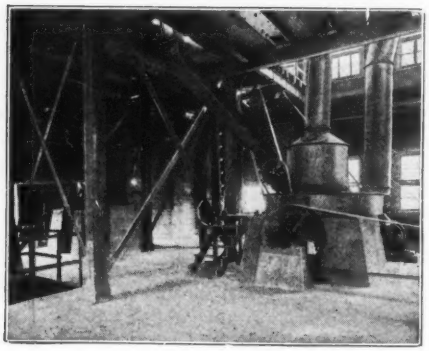

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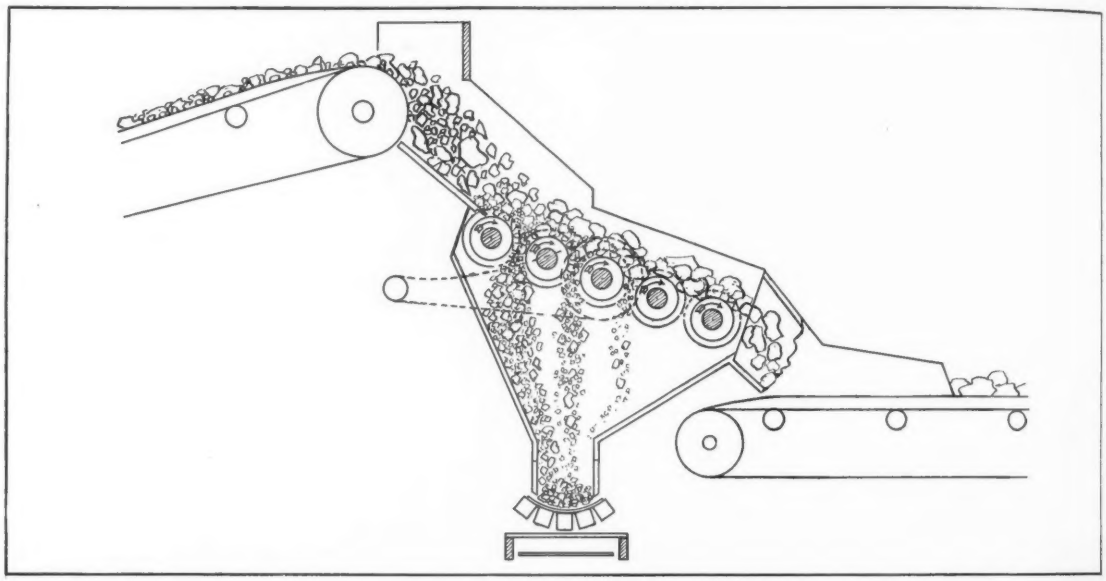

THERE is no evading the fact that many producers of non-metallic minerals have placed their stamp of approval on the Robins Cataract Grizzly. The kind and extent of service it has given users is better indicated by the enthusiastic endorsements unhesitatingly handed us; but the convincing evidence, the confirmation of its unusual value, is best shown by repeat orders.

Read what Mr. Sterling Tomkins of the Tomkins Cove Stone Co., Tomkins Cove, N. Y., sent us recently.

> **"Replying to your inquiry as to the Cataract Grizzly installation at our plant at Tomkins Cove, I might say that taking into consideration initial cost, space required, ease of installation and screening efficiency, I believe there is no other screen on the market that will compare with it."**

Since this letter was written, Mr. Tomkins has indorsed his opinion in a practical way, by ordering two more Cataract Grizzlys.

Robins Conveying B

RACT Grizzly

There are producers who know the Robins Cataract Grizzly for its ruggedness, endurance, and its ability to withstand punishment. They are the producers who recognize it as an achievement in operating economy. Among our list of satisfied users are:

The Michigan Lime Stone and Chemical Company
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Bound Brook Crushed Stone Company

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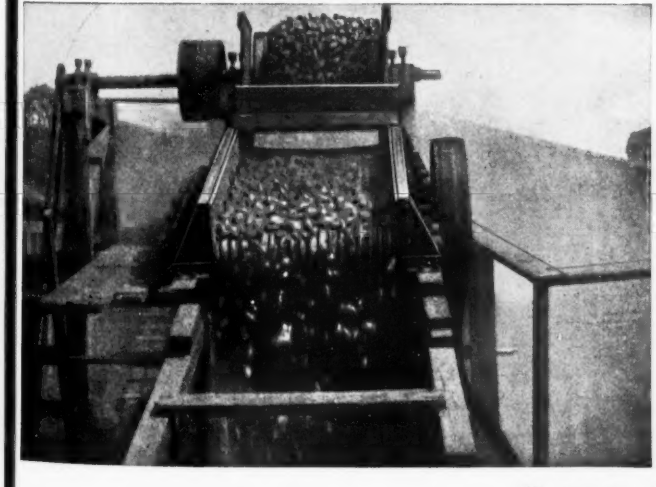

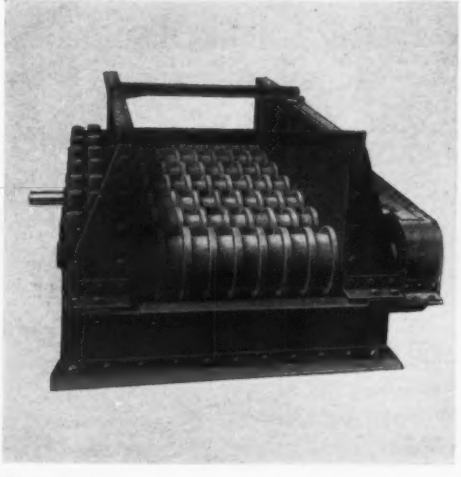

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Rock Products

Volume XXV | Chicago, December 2, 1922 | Number 24

Cutting Quarry Costs 40 Per Cent

Open-face quarry work has been abandoned at the Peerless White Lime Co., Ste. Genevieve, Mo., since the company has found that it can mine stone approximately 40 per cent cheaper

NEAR Ste. Genevieve, Mo., on the Missouri and Illinois Railroad, are the lime plant and quarries of the Peerless White Lime Co., a subsidiary of the Hunkins-Willis Lime and Cement Co. of St. Louis. This plant replaces the company's original plant, which was completely destroyed by fire in May, 1921. It is considered one of the most modern and efficient operations in the Middle West.

That this operation is considered efficient is due largely to the fact that a successful mining system has been employed which makes possible the delivery of stone into the kilns at a cost approximately 40 per cent less than the former open-face quarry method. The abandonment of the old operation was necessary because of the almost prohibitive expense of removing the overburden.

J. R. Thoenen, mining engineer of St. Louis, was consulted, and after a careful survey the company reorganized the quarry crew and started the system of room and pillar mining.

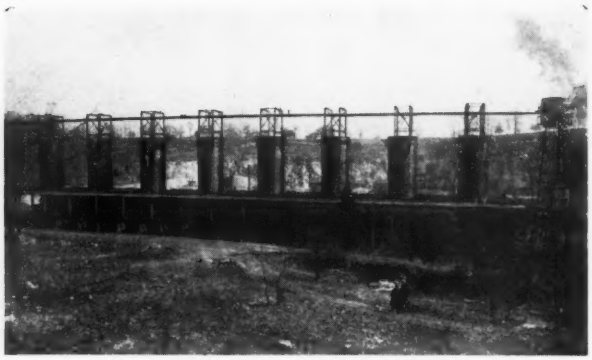
Tunnels 40 ft. wide were first opened to a height of 12 ft., and were kept at this average height and width until the desired depth had been reached. During this operation the stone was removed from the tunnel as it was mined and the tracks were left on the floor as originally placed. When the opening had been completed, as in the instance of two tunnels 300 ft. long, 12 ft. high and 40 ft. wide, the plan of operation was to take down the roof at the back end by raising vertically 10 ft., working forward toward the original entrance by a combination of breast and back stoping and using the exess of shot down stone to work on. The same procedure was repeated, the drilling being directed in the same way toward the back of the tunnel, the roof being taken off in 10-ft. strata each time the drillers went through. This procedure was continued until the tunnel attained a height of 50 ft., the maximum height permissible to operate, considering the formation of the deposit.

Up to the present time, the company has opened three tunnels, two of which are opened to a depth of 300 ft. The third will be opened to a depth of 1000 ft. when finished, and this tunnel alone will furnish sufficient stone to the eight kilns to keep them supplied for 500 continuous days at the rate of 40 tons per day per kiln.

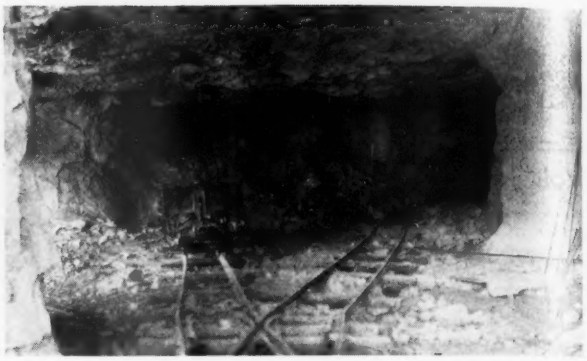
General view of the plant of the Peerless White Lime Co. In the foreground are shown the kilns and lime shed; in the center, the warehouse and office; to the right, the hydrating plant, power house, and machine shop; to the left, the cooper shop, the barrel storage and the garage

The company has found that the advantages of mining over its former open-face method are many. The following points in favor of the mining method are, of course, characteristic of this one particular operation:

(1) Natural storage—When the stoping method is in use the fallen broken stone remains on the floor of the tunnel until it is needed. Cars are loaded from this storage and conveyed direct to the kilns. This is also true of the smaller stone or spalls,



As the kilns appeared after the fire



Interior of one of the tunnels

and there is but one handling of the raw material.

(2) Independence of weather conditions.

(3) Fewer spalls—This is accounted for in that less force is required to bring down the stone than in open-face workings, resulting in larger sizes.

(4) Spalls are 100 per cent free from dirt—In outside quarries a larger percentage of spalls are wasted or mixed with the dirt and mud usually found on the quarry floors.

(5) Less explosives—Because less force is required to bring down the stone, due to gravity.

The stone for the kilns is loaded into removable boxes of 2-yd. capacity mounted on flat cars. Trains of these loaded cars are moved by cable steam hoists to a storage track at the foot of the incline leading to the top of the kiln. Two cars, a total of 5 tons, are hoisted up the incline at a time. Upon reaching the top the boxes are hoisted from the cars and conveyed over a structural steel frame-work and dumped automatically into any desired kiln.

Eight vertical kilns 14 ft. in diameter and 55 ft. high, each having a daily capacity of 20 tons per day, consume the greater part of the mine's output. Burning is accomplished with producer gas, Franklin county (Illinois) coal being used exclusively. The kilns are equipped with duplex gates which regulate the discharge of the lime into ½-ton capacity steel buggies. From these buggies the lime is dumped on the concrete floor of the lime shed, where it is hand picked, as only choice lumps are sold in lump form.

This water tank, of 60,000 gal. capacity, supplies the entire operation

The hydrating equipment consists of a No. 1½ Sturtevant rotary crusher, Link-Belt conveying and elevating machinery and a No. 4 Kritzer, six-cylinder hydrator. In addition to this equipment there is a Raymond air separation system and a Bates valve-bag machine. Below this bagging machine there is a hopper to receive all the spillage. This hopper discharges on a conveyor which returns it to a storage bin above the hydrator.

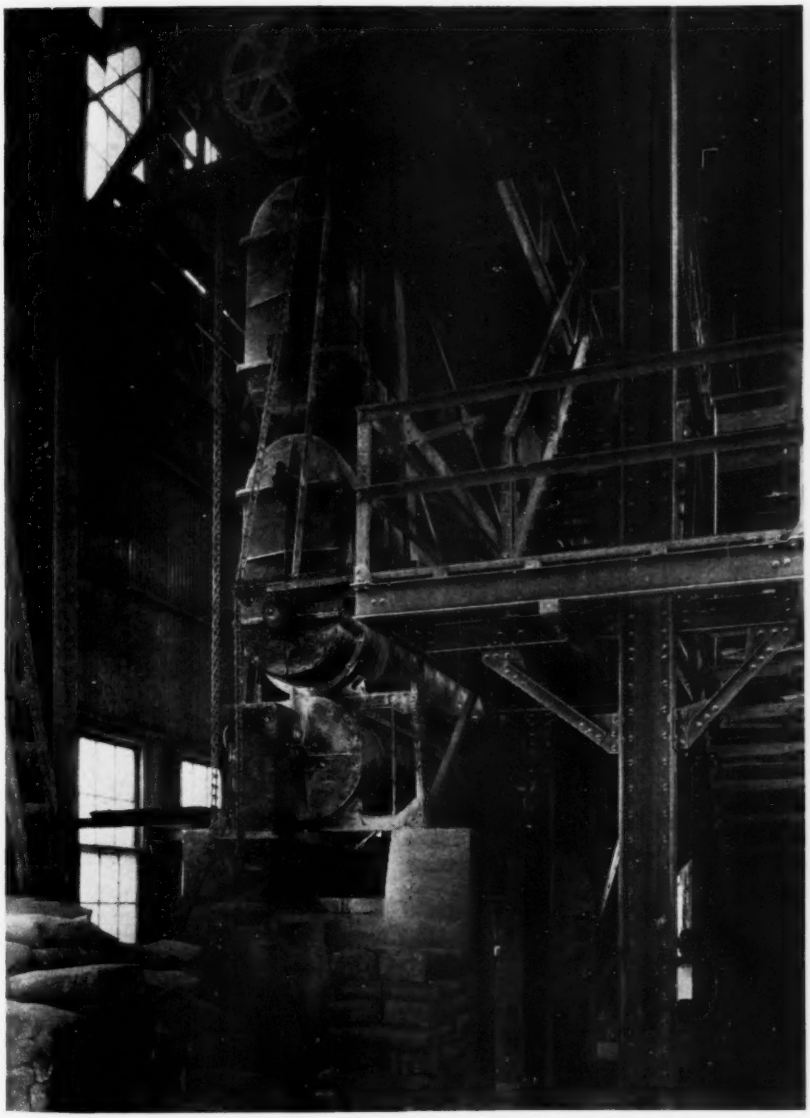
The hydrating plant adjoins the lime shed, the lime being conveyed to the crusher. Here it is crushed to a fineness of ⅜ in. and smaller. This crusher discharges into a bucket elevator which empties into a steel storage tank over the hydrator. The lime feed from the tank into the hydrator is constant and a flow of water into the hydrator is regulated in proportion to the calcium oxide content. This regulated water supply, together with the circulation system through the hydrator, keeps the water content within ½ of 1 per cent of a theoretical hydrate.

The hydrator discharges direct into the air separator which separates the core and all foreign matter, thus producing a fin-

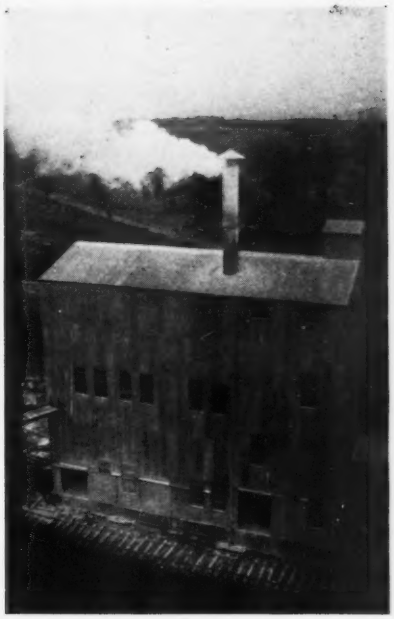
Entrances to two of the tunnels

The trackage system from the mines

To the right is the 120-hp. Corliss engine; at the left, the air compressor. Since this picture was made a 300-hp. Corliss engine has been installed at the left-hand end of the building



The Kritzer hydrator. Note that the building is of steel construction



The hydrating plant. The windows provide ample light for the necessary repairs

ished hydrate. This product is ground to a fineness of 100 per cent through a 100-mesh sieve, and 99.91 per cent through a 200-mesh. The finished hydrate is discharged from the separator into a bin over the bagging machine and is fed direct into the bagger.

With the exception of the cooper shop, all of the buildings are of structural steel and concrete construction and are fireproof throughout. The lime shed is 90 ft. wide and 300 ft. long, with a platform extending its full length for loading box cars. This feature permits the loading of 10 cars at a time.

A typical example of the quality of lump lime the company ships in bulk

The hydrating plant is so constructed as to permit the future installation of another complete hydrating unit. Every detail for such an addition was given careful consideration when the original plans were drawn. The plant now has an output capacity of five tons of finished hydrate per hour.

Adequate storage is provided for barrel and sacked lime. Warehouses directly across

This is an interior view of the lime shed and shows the design of the concrete pillars

the tracks from the hydrating plant and lime shed have a total capacity of 4000 bbl. and 30,000 sacks of lime. Storage is accomplished by trucks, as platforms connect the hydrating plant and lime shed with the warehouses.

Power equipment comprises one 300-hp. and one 120-hp. Corliss steam engine. Two Laidlow air compressors—one a duplex type for daily use with a capacity of 1100 cu. ft. per min., and one a single-action type for emergency use—furnish the air for the drills and miscellaneous purposes. This equipment is furnished steam by four horizontal tubular boilers having a total capacity of 400 hp.

The company has just completed the installation of an American pulverizer and a large Ruggles-Coles drier. These machines will size and dry the undersize or spalls as it comes from the mines. The finished product will be from dust to 1 in. and can be loaded from the drier into cars for shipment. This product is used chiefly by glass factories.

All the barrels are made in the company's own cooper shop, which is modern and complete in every detail and has a capacity of 400 bbl. per day. Storage is provided for 2000 bbl. in a building located between the cooper shop and the lime shed.

In order to get the most efficient and economical results from its coal consumption, the company has employed the services of a combustion engineer, Victor J. Azbe, of St. Louis. Mr. Azbe has already made great improvements for this company and will strive to further reduce costs and increase production.

The following is the personnel of the company: Gordon Willis, president; D. S. Hunkins, vice-president; W. S. Fitzroy, sales manager; R. A. Burch, auditor, all of St. Louis, and W. R. Bupp, plant superintendent, Ste. Genevieve, Mo.

Boosting Winter Construction

TRYING to straighten out the curve of construction and pull up the sag which always occurs during the winter months, particularly in the northern part of the country, is a worthy effort from many standpoints. It makes production of building materials more uniform and therefore increases profits and decreases both cost and waste.

At the same time it surely helps to decrease the unemployment problem, which is always more serious in the winter months when construction and agricultural work are not so abundant as during the summer.

A booklet which will interest producers of aggregates as well as cement makers and construction people is one entitled "Concrete Work in Cold Weather" published by the Portland Cement Association. The booklet has many helpful suggestions on carrying on cold weather construction work such as methods of keeping the aggregates from freezing, the proper heating of the concrete structure to prevent freezing before setting, and in addition to the general information and interesting photographs there is a set of 10 rules entitled "Particular points for cold weather work." Copies of the booklet are available from the Portland Cement Association's offices in Chicago or from any of its branch offices.

The valve bag machine is located near the loading platform

Screens for Washing Plants

By Edmund Shaw
Consulting Engineer, Chicago

No. 4—This concluding installment deals with the not-much-used shaking screens and the electric vibrating screens, which modern practice prefers for fine screening

WHILE shaking screens are not much used in washing plants, there are exceptions, and in at least one plant in the Middle West they are being used with good success. In this plant they are employed as fine sand screens, rescreening sand from the settling tanks, and working without the addition of water to the partially dry sand. The screen was designed and built by the plant manager.

Vibrating screens of course, are used in great numbers in washing plants, and are increasing in popularity; they seem destined to oust all other forms for fine screening. Shaking and pulsating machines will also be described, not because they are so much in use as by reason of their place in the evolution of screening machinery, and because they are interesting machines in themselves.

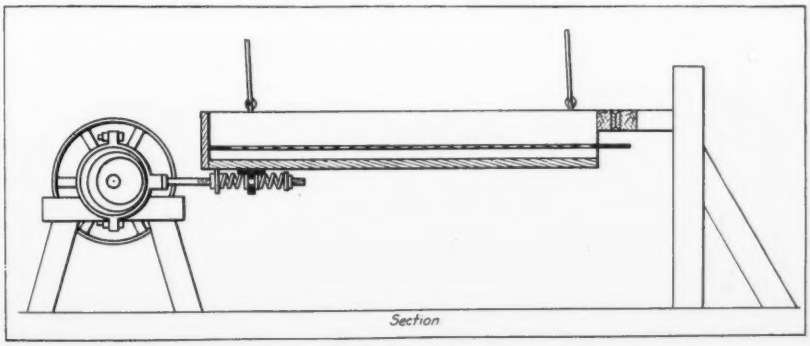


Fig. 15—Endwise shaking screen—a good screen but apt to shake down the building, and it often needs repairing

The Difference Between Shaking and Vibrating Screens

The distinction between shaking and vibrating machines is that the shakers move the frame and the screen fabric with it, while the vibrators move only the fabric while the screen frame stands still. The shaking form is much the older, the vibrator in its best form being a camparatively recent invention.

We may divide the shaking screens into endwise shakers, sidewise shakers, gyratory machines, and pulsators. The names of the first three are self-explanatory. The pulsators have an up-and-down motion of the screen frame, either combined with an endwise shake or without it. They approach the vibrating screens in their action, and one type, the impact screen is really a vibrator, vibrating the frame.

The endwise shaking screen is illustrated by Fig. 16, in which only enough is drawn to show the principle of operation. The screen is flat and there is a flat pan under it to catch the undersize. A slight slope from the feed to the discharge end may be given, but usually the travel of the material is sufficient without it. This travel is caused by the motion of the screen imparted to it by the eccentric at the end. It will be noted that this is a double eccentric by which the length of the throw may be adjusted.

At the end of the screen is placed a bumping post with a rubber pad which the screen hits at the end of every stroke. (Other forms do away with the bumping post by having a quick return head motion that jumps the screen back, but the bumping form is a little easier to understand.) It is the stopping of the motion of the screen by a bump that causes the material to travel on the screen. Springs on the underside of the screen pan prevent the bump from being communicated to the eccentric and breaking it.

The reason for the travel of the material may be understood by performing a very simple experiment. If you will lay a nickel on a book and then strike the edge of the book gently against anything you will find that the nickel will travel forward an inch or two every time the book is struck. The book is stopped every time it is struck but inertia carries the nickel along.

Various Screen Supports

There are various methods of supporting the screen in these machines. Fig. 1 shows it supported by rods hung from above, but it is also placed on slides and supported by rods placed below.

Probably more of these endwise shaking screens have been constructed than any other kind of shaking screen. They are easy to make and the materials for their construction were always at hand in the old concentrating mills, in which screening machines were developed before washing plants were in existence. They have a large screening capacity and do pretty fair work, but they are subject to the same trouble that affects all shaking screens; they shake themselves to pieces easily and the repair bill is high. Hence they are not recommended except as some ambitious operator of a small plant may desire to know how to make one to help himself out with some screening problem.

Quite recently the writer saw a very successful installation of an endwise shaking screen in a Pennsylvania plant. The novel feature was that the screen was running under water. The screen was hung from swinging rods, like those in the illustration, at the bottom of a broad trough through which the sand and water flowed. It was shaken by an eccentric which was mounted on top of the trough and communicated its motion to the rods instead of directly to the screen. The sand which passed through the screen fell into a box the sides of which were higher than the trough so that no water escaped, and an inclined screw lifted the sand from the box and over the edge so that the sand was discharged dry. The screen fabric was 10-mesh wire cloth.

The sidewise shaking machines set the screen on a slope and gave it a shake from side to side so that the grains took a zigzag path down the slope. The writer only knows this machine from descriptions in books and hence can say nothing as to its value as a screening machine.

The Gyratory Machine

The gyratory machine at one time was widely used in coal-washing plants, and there is a possibility that it might be de-

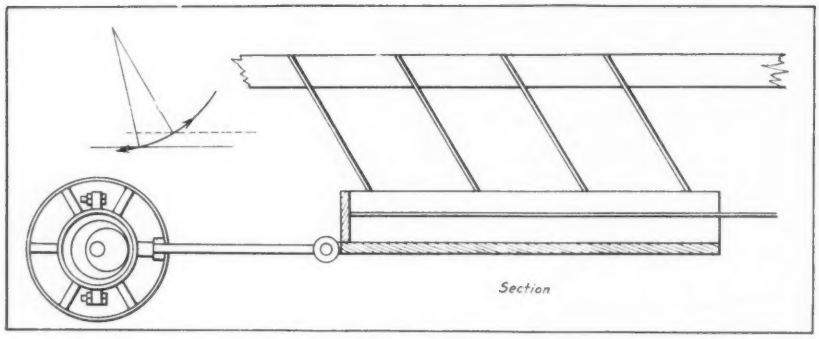


Fig. 17—Pulsating screen of an old and much copied type

veloped into a good gravel screen, as its best work is done in coarse mesh screening. It is said to have a high capacity and to be free from blinding.

The drawing of the complete machine is rather complicated, but the way it works is shown in the diagram, Fig. 17. The screen and the pan for the undersize underneath are set at a slope of about 5 deg., but there is a slope from corner to corner as well as along the length of the screen. A crank underneath gives both pan and screen a circular motion.

As the motion of the screen is in a complete circle, there is no jar or bump to shake it to pieces, as with the shaking screens of the endwise and sidewise type.

A gyatory screening machine, with which probably most of the readers are familiar, is the Ro-Tap machine for making screen tests. It is to be found in practically all laboratories where sand is tested. The writer has used it a great deal and has been astonished at the exactness with which two screen tests from the same sample would check one another—a result that is hard to obtain when the screens are shaken by hand. In the Ro-Tap machine the gyratory motion is combined with a slight bump, or jar, which helps to keep the screen clean, especially with fine mesh screens. If the work of this testing machine is any criterion, the gyratory method of screening is excellent.

The Old Ferraris Machine

Of the pulsators, those which move the screen up and down, the old Ferraris machine will be described as it is one of the best that has been made. It is a European machine, but has been copied in a number of forms in this country. The pulsating motion is combined with an endwise motion that urges the material forward about as in the endwise shaking screens.

The diagram, Fig. 18, illustrates how it works. The screen is horizontal and is suspended at the end of four straight springs set at an angle of 60 deg. or so from the horizontal. Motion is imparted to the screen by the eccentric and connecting rod at the end. The effect of this motion is to move the screen back and forth, but the effect of the springs (as they are set at an angle) is to move the screen up and down through a short circular arc. The net result of these motions is to give the screen a forward and upward motion on the out stroke and a backward and downward motion on the return stroke, so that the material to be screened is thrown away from the screen and caught at a new place a little farther on when it descends. This motion of the material, it will be noted, is much like that given in the new vibrators, of which this machine was one of the forerunners.

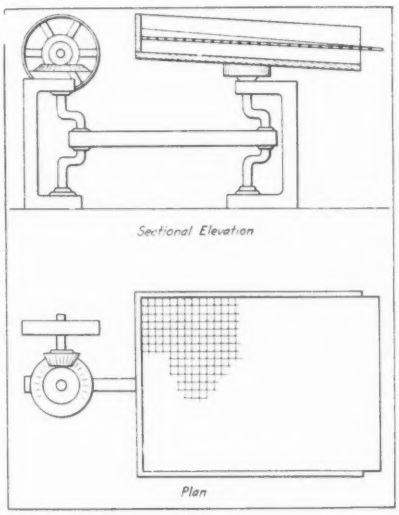


Fig. 16—Diagram of a gyratory screen—not much used in washing plants but a type that might be developed for such use

The copies or variations of this type of machine gave the same motion to the screen by means of eccentrics or cranks combined with rocker arms placed below the screen.

A type of pulsator which is even nearer the vibrators of today is the impact screen, used to some extent in the washing plants of the West. It has a true vibrating motion, but it vibrates the frame as well as the screen.

The method of operation is shown in Fig. 4, where the screen frame is suspended on elliptical springs, like wagon springs. These springs may be given more or less compression by means of the setscrews shown below them, and this compression regulates the force of the vibrations.

There are two small blocks set on the upper side of the screen frame, and these blocks are struck by the teeth of a ratchet wheel as the ratchet revolves, giving the screen a rapid pulsating or vibrating motion. When it is working right, the screen appears to stand still and the oversize appears to be separated from it by a short distance.

The writer has used a great many of these screens and found them excellent as screening devices, but rather hard to keep in repair. They are used for wet and dry screening. When used for wet screening the pan that caught the undersize was set rather closely to the screen so that a little water splashed up through the meshes on the return stroke. This was supposed to keep the meshes open, but the writer never found that there was any serious trouble from blinding whether water was used or not. Like all vibrating screens, this had a large capacity for a small screen area.

Mechanical Vibrators

Mechanical vibrators, which vibrated the fabric and not the frame, were introduced in great numbers a few years ago, and some of them are still on the market. The interested reader may find pictures and descriptions of a number of them if he will hunt back through the pages of his old files of Rock Products.

All of these were much the same thing—a stationary screen set at an angle of from 40 to 45 deg., the fabric being vibrated by some method that particularly appealed to the designer. In one example,

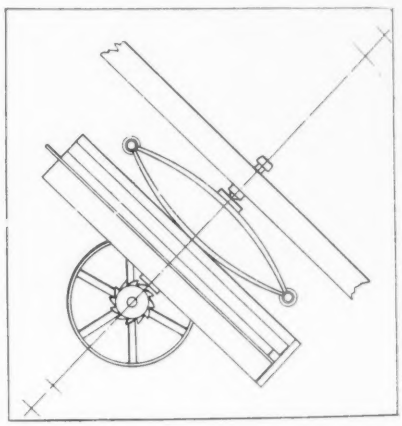


Fig. 18—A vibrating screen—forerunner of the more modern types

which may be considered typical, the fabric was vibrated by being struck by a series of little hammers. Others either pushed or pulled the fabric by eccentrics of slight throw.

The work of most of these machines was excellent, and many of them are still in operation and giving good results. But

they are being largely superseded by the electrical vibrators, which do as good or better work, are easier on screen fabric and other repairs, and which have other advantages in installation.

These electrical vibrators make a very simple plant, as there is no need of shafting and belting. They can be set anywhere that a wire can be run to them provided that current is available. For this reason they fit in well with the use of stationary screens for the coarser screens as a plant with stationary screens needs no power equipment nor shafting.

A great many of these screens have been placed in washing plants in the last two or three years, and their use seems to be increasing. The writer noted that no other type of screen seemed to be employed in what is perhaps the sand and gravel plant of largest daily output in the United States.

These screens are stationary screens with the fabric vibrated by means of a special electric motor which gives a rapid reciprocating motion. They run at high speeds—3600 vibrations per minute, the catalog of one maker says—and to the eye they appear to be standing still. The vibration is through a very short distance, but it is sufficient to keep the screen open and to give the grains of the peculiar path of the grains, so the proper fabric to use with these screens is a square mesh wire cloth.

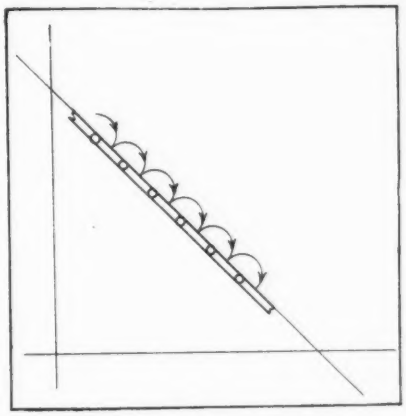


Fig. 19—Path of grain down the face of a vibrating screen

An electric vibrating screen in action is shown in Fig. 20.

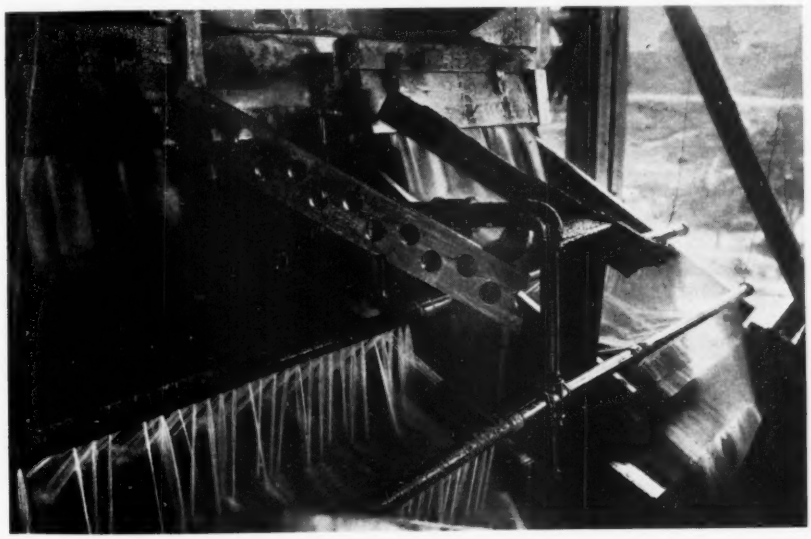


Fig. 20—Electrical vibrating screen in action, with sprays added to rewash the oversize

their peculiar travel. In relation to the surface of the screen, this path appears to be made up of a series of little hops or jumps, as if the grain were trying every mesh that it passed. This is shown in Fig. 19, but it must be remembered that it is motion of the screen as well as the grain that is indicated in the path.

In the article on stationary screens it was shown that the opening of the screen must be a slot and not a square hole to allow for the speed of the grain falling down the slope of the screen. This does not apply to these vibrating screens on account

Conclusions

To sum up what has been said in this series and to draw a few conclusions from them, we may say that:

1. The usual practice in washing plants is to use revolving screens; they are not only good screens but good scrubbers. With limited amounts of water they are always to be preferred.
2. Stationary screens may be used if the feed is accompanied by plenty of water. If the screens are properly installed they will do reasonably good work, especially on the coarser sizes, without blinding and without much attention.
3. For fine screening the electric vibrating screens are to be preferred. If the electric current is not available there is a wide range of screens to choose from, including such machines as the outside fed trommel, the belt screen and various sorts of shaking machines. The choice is largely a matter of one's personal experience with the particular kind he chooses or rejects, as all of them are capable of doing good work under some conditions.

(Concluded)

Establish Sand and Gravel Rate

USERS of sand and gravel in the Birmingham, Ala., district will receive a rate of 75 cents a ton on shipments from Montgomery and Jackson's Lake under a compromise agreement between the railroads and A. J. Ribe, as agent for the sand and gravel companies in this district.

This was approved by the public service commission. The railroads will absorb the switching charges in the switching limits of Birmingham and the new rate will be net to the consumers.

The agreement followed an application for rehearing of the original case which was filed by Mr. Ribe and which resulted in an order of the commission for the establishment of a rate of 60 cents a ton. The railroads contended that this rate was too low and contended for a rehearing.

The original rate was 75 cents a ton plus the switching charges in the Birmingham switching zone. The commission directed the railroads to prepare new tariffs in line with the reduction in rates.

Indiana Wants 180,000 Barrels of Cement

INDIANA'S highway department has advertised for bids for a part of the portland cement required for next year's hard road construction program. This early action is taken by officials of the local cement companies to mean that the state highway commissioners not only intend to start new activities early, but also that they realize the necessity and importance of prolonging the construction season.

The bids ask quotations on 180,000 bbl., the material no doubt being wanted for use in the first resumption of activities. The contractors' bids also have been published, and it is unofficially stated in this market that the awards for both the material and work will be let before the first of next month.

The early awarding of contracts, both for a part of the portland cement required and the construction work, means that with a big program planned it is considered important that shipments of materials will not be restricted to a short period during the summer season.

Problems of Distribution

Success in business does not end with successful production, but depends as much, or more, on successful distribution. Too much competition in distribution, as well as too much competition in production, is a primary cause of high prices

A GREAT hulabaloo was raised during the current year because the prices of portland cement about the country, and of different brands at particular places, were fairly uniform. The public made much of these facts and portland cement manufacturers were prosecuted in the Federal courts largely because of these facts. It has since been pointed out why prices of a standard commodity must become uniform, and it is in the interests of all concerned that they be uniform. It proves that some of the problems of economical distribution have been solved.

But it is no wonder that the public does not understand the economics of distribution because business men themselves have very little real knowledge of the subject. Producers of every commodity have been accused of excessive profits because the public feels that the consumer price of that commodity is too high and the public is quick to suspect combinations of producers for control of production. As a matter of fact, the real cause of high prices in most instances is uncontrolled production and distribution. When the time comes that the laws of economic distribution are as well understood as the laws of production; and when distribution is as well controlled as production can now be controlled, even if illegitimately, the public will be vastly better off than it is today.

These facts are brought out in the remarkable paper which follows originally presented to a conference of business-paper editors in New York City, by O. D. Street, general manager of distribution of the Western Electric Co. While his illustrations are drawn from the electrical trade, his main argument applies with equal force to manufacturers of portland cement, lime, plaster, crushed stone, sand, gravel, or any other commodity. Extracts from Mr. Street's paper follow:

Middleman or Dealer May or May Not be Necessary

Let me say at the outset that I propose to take no time arguing the question as to whether there is a place in American business for the middleman. I am aware that volumes have been written on that subject, but I assume that we who are gathered here today are of but one mind in recognizing that in a country with a population of 106,000,000, covering an area of more than 3,000,000 square miles—a country dotted as this is with thriving, growing cities and towns throughout its length and breadth, and with all these growing trade centers connected by the most highly developed system of communication and transportation possessed anywhere in the world under such conditions, there can be no doubt as to the need of middlemen.

With us something like 60,000,000 of our consumers derive their sustenance from agriculture and mining—the sources of our basic raw materials. It is inconceivable that the necessities and luxuries of life which are purchased by these 60,000,000 consumers—workers in the basic industries—can be moved economically from the industrial centers, where the finished product is made, to the small cities, country towns, farms and ranches without employing, in the process, distributing facilities offered by middlemen.

However to say that the middleman is a necessity in our economic life is something very different from saying that the middleman is a necessary link in the distribution of every commodity or is a necessary agency for disposing of the output of every factory. The middleman is not essential to all these, and middlemen as a class hurt not only their just claims for recognition, but they place themselves squarely across the path of industrial progress by contending that they are an essential link in the distribution of all things. The sooner middlemen perceive what their true functions are, and then devote all their skill in performing these functions well the better it will be for them and for all of us.

Contrary to what some seem to think, there is no social movement developing which, by its momentum, will eliminate the middleman. But there is, and rightly so, a rapidly growing demand that the waste incident to present methods of distribution shall be eliminated. Any established trade channel which can prove its efficiency will survive, otherwise it should and will fail.

No Standard Plan of Distribution

Distribution is too often thought of, not only by the public at large but sometimes by the distributors and producers as well, as being a standardized method available for use in the process of transferring commodities from the factory to the consumer. As a matter of fact, there is no such thing as a standard plan by means of which commodities may be distributed most economically. Instead of there being one right way of marketing, there are many right ways. What the right way is for any producer can and must be determined by the producer—not by chance, not by rule-of-thumb, but as the result of a comprehensive, intelligent analysis of his own problems and products.

Such an analysis may not prove that it is wise for a given manufacturer to sell all his products direct to the consumer, nor will it of necessity prove that he should work through wholesalers in marketing all his lines. Instead it may prove that, for a manufacturer who is not making just one thing but many things, the best plan would be to work directly with the consumer on one or more of his commodities, to go direct to retailers on others of his commodities, and to work exclusively through wholesalers on still another group of his commodities.

If the analysis is made as carefully as present-day intelligence permits it to be made, the one best way for marketing each product of each manufacturer should be determined rightly nine times out of ten.

80 Per Cent Sold by Makers to Wholesalers

I have heard it said that about 80 per cent of our merchandise is sold by the makers to wholesalers who in turn supply the retailers. A smaller percentage is sold direct by the makers to the retailers, and a still smaller percentage is sold direct by the makers to the consumers. All these methods are good and will continue to be employed. Which method to use is the problem each producer must decide for himself, and the problem will be solved first by those concerns which possess a type of a management wherein is to be found the searching mind, and wherein lies the will to find the correct answer. What we want is the right answer, and to get that answer with the least possible expenditure of time and money. I have not the whole answer—no one has—but we do know certain necessary vehicles which must be provided, necessary tools which must be employed, by him who has the will to search out the right distributing principle to be applied in the conduct of his individual business.

Controlling Factors in Distribution

Among the more controlling factors which must be considered by each producer who would get the right answer are these:

1. *The nature of the product*—A large steam engine should be sold direct to the user, whereas hairpins, to be marketed economically, must be sold to wholesalers and possibly to large retailers.

2. *The number of customers served*—A few users, even though these may be widely scattered, can usually be served best by dealing directly with the factory, provided the money value in each sale is large. A great many customers scattered all over the country can, as a rule, be served best through jobbers, particularly if the value of each sale is relatively small.

3. *The aptitude of the management*—Some executive families are experts at production, but ought never to try distribution. The two require quite different commercial characteristics, and management should know its weaknesses as well as its strength.

4. *The financial resources*—Where capital is limited it is often preferable to use all that is available in production rather than to skimp on plant, tools and other instruments of economical production in order to carry the capital obligations involved in distribution.

At the present time too many concerns are selling their own products direct which would be better off if they worked with jobbers. There are also too many of another class which would be better off if they cut out the jobber and dealt direct with the retailers and consumers. By the same token, there are jobbers who would be better off if they limited themselves to those items which they can handle better and more cheaply than the factory, and not try to be all things to all men.

Costs of Distribution Not Known

The reason why so many uneconomical methods of distributing are employed today is because so little is known even by the most expert, of what it costs to sell and distribute merchandise. The monthly or annual costs of distributing all the products of a mill, or all the lines of a jobber, are known, but while these figures tell us how much money is made or lost on the entire business they do not tell us how this money is made or lost. How antiquated is such a condition in production activities!

Methods are available today, as a result of the development of the accounting art, which will show us almost exactly what it costs to manufacture each item and each piece part in an item, but there is scarcely a concern in the country which knows what it costs to sell any one of its articles, unless it makes only one article, nor a concern which knows what it costs to sell to any one of its customers. A knowledge of what it costs us to sell each article we make, and what it costs us to do business with each customer we serve, is a prerequisite for determining whether we can distribute those articles and serve these customers cheaper and better than we can hire the work done for us. The facts must be determined by the producer—by each producer for himself—as he alone can get at the facts.

The very first thing then which is needed is the development of a cost-finding system which will give to each manufacturer a statement as to what it costs him to distribute each individual article he manufactures, and what it costs him to serve each customer he sells to. Our shop cost-systems have been highly developed, but little or nothing has as yet been done by accountants in any line of industry towards the development of a cost-finding system which gives to management even an approximate concept of what expense is involved in the sale and distribution of his individual commodities, or what it costs to sell to his individual customers.

Production Efficiency Exceeds Distribution Efficiency

Business is far from being a pure science. It is a science, nevertheless, but the trouble with business men is that they have confined their scientific research largely to the field of production, and have applied little or none or it to the problems of distribution. As an inevitable result, the superior skill which has been applied to production problems has caused production efficiency to get far ahead of distribution. The production skill which industry has developed has gone out and started competing factories until today we find ourselves confronted with a situation where the capacity to produce, and to produce skillfully, in most industries, vastly exceeds the country's capacity to absorb—at least to absorb at the prices now quoted to the consumer.

Uncontrolled Competition Raises Costs

Why is it that the price is so high that more commodities cannot be sold? It is not because the maker, the middleman, the retailer or anyone else, except in isolated instances, are profiteering. The answer is twofold: In the first place, it is because the new competing factories turn out no more or as many units than did the original factories hence, as a rule they do not produce at a lower cost; in fact, too often the tendency is to make production costs rise since the new competition, rather than to dispose of its products by creating new markets, usually cuts into the business held by the older factories.

In the second place, new producers, in order to market their products, often appoint a separate group of wholesalers and dealers and these in turn cut into the business done by the old established distributors. At first, competition—one maker with his distributors fighting to hold their business, another group fighting to get this business away from them—may and often does tend to reduce the price to the public. Soon, however, the heat of contest cools. Each organization decides to add the increased overhead cost incident to a lower volume of sales into its selling price, so it is passed along to the public. As time passes, still more producers enter the field to share the new business and divide the old, and these, in turn, create new distributors whose competition tends still further to complicate the situation and add to the ultimate cost of the product.

Mass Production Required

For the good of the public at large too much competition may well be as bad as too much monopoly, for it is a recognized fact that mass production, up to a certain point at least, is required in order to effect low production costs. Too much distribution—that is, too many middlemen—is just as bad, for a low volume of sales increases the distributing expenses per unit sold just the same as, at the factory, a small output increases the costs per unit produced, and in both instances there is the natural tendency to pass the increases on to the consumer.

There can be no doubt as to what all this hue and cry we hear today about distribution and present distributing methods means. It means that public opinion—that same sort of public opinion which when aroused says what shall be in our political life—is today, in our commercial life, becoming synchronized. Our people in general do not readily get excited over either political or commercial questions. But if the time comes when failure to act on the part of those whose duty it is to act stirs the patriotic conscience or drains the pocketbooks of an appreciable percentage of the people, then it behooves the politicians or the merchants to act, and act rightly.

The man in the street is not a statesman nor is he an expert on business problems, nevertheless he does love his country and he loves his home and kin. Because of these twin loves, he is bound to demand and sure to fight for that which promotes their interest and welfare. He does not know what is wrong in the business organism, and not being an expert, he cannot find the answer, but composite public opinion of which his thinking is a part, is going to insist that management find the answer.

Decisions of the Average Man Control

All he knows is that he has gone to a retailer to see if he can buy a certain labor-saving device for the home, which he has wished to procure for his wife in order to relieve her of some of her drudgery. The price quoted was $125, and in spite of his good intentions, he has decided he cannot make the purchase, as he is unable to afford so great an expenditure.

Upon getting home that night, he is told by his son, who works in the cost department of the factory where the device is made, that the factory cost of that device, including labor, raw material, and all overhead, was but $50. "Why," he asks, "must I pay $125 for an article which can be made for $50?"

Because he is not familiar with the ramifications of commercial transactions he assumes some one is profiteering. The retailer assures him that it is not he who is

profiteering, but agrees with him that the price is too high, and insinuates that the trouble lies with the middleman and the producer. The middleman in turn admits that the price is too high, yet tells him, and as a rule truthfully, that he has made no net profit out of the transaction and that if anybody is profiteering, it is the producer or the retailer. So he gets no satisfaction, but he does not forget that somewhere between production and consumption $75 is being spent on an article which it costs but $50 to produce.

While he is no expert, he has a hunch that such a condition is all wrong, and I agree with him; furthermore, as business men, I am sure you likewise agree with him. Yet at this moment there are probably 50 men, engaged in production and distribution, who are saying that the answer is to still further raise the retail price and make the allowance to the distributors greater to every one man who says: "No, that is not the answer—the answer is to change production and distribution methods so as to permit of a reduction in the price charged to the consumer."

The example cited above is typical, you know, of a thousand more just like it, and all the explanation in the world, not even the combined efforts of all the newspapers and trade papers in the country, can make this sort of thing seem right in the minds of the buying public. The only thing with which the public will be satisfied is a different sort of setup, and it is up to management to find the answer and lead the way. The theory that such expenditures are necessary to a proper system of marketing is absolutely baseless, and, in all earnestness, I plead with you, the editors of the business papers of the country, to use your heads and your pens to bring about a changed condition.

Please understand me. In the main, there is no profiteering anywhere along the line either on the part of the producer, the wholesaler, or the retailer in connection with the sort of commodity above referred to. At best, only a modest net profit was left to any party in the process. The trouble is not that those who are engaged in production and distribution today are profiteering. The trouble lies with the system employed, with the methods followed. It is these which must be changed. Present methods are wasteful. Ways and means must be devised for eliminating this waste.

I have just referred to a semi-luxury which as made costs $50 and as marketed sells for $125. The statement that neither the jobber nor the retailer made much, if any, net profit on the transaction will, of course to the layman, sound absurd, yet it is the truth. However, the identical article—and there are a thousand others of which the same can be said—could be so made and so marketed as to enable the public to buy it for $75 and still allow ample net profit for the maker, for the jobber and for the retailer. The trouble is due to the excessive competition that exists. Factory costs are too high because too few units are turned out; the wholesalers' and retailers' expenses are too high because too few units are sold.

A few years ago dealers were well satisfied if they could buy at a discount of 25 per cent, but today dealer discounts of 40 to 50 per cent, and occasionally 60 per cent, are more or less standard for furniture, rugs, carpets, refrigerators, stoves, victrolas, etc. Goodness knows what discounts the dealers of tomorrow will ask for, and possibly require, unless production and marketing methods are changed.

More Men of Ford's Genius Needed

One thing we need is more men who, like Henry Ford, can visualize a possibility for trade development, and who will, by mass production and by rapid turnovers in distribution, produce and market a product which will make the public feel, when they buy it, that they have secured their money's worth and then some. More men with brains and capital who will "Fordize" in the production and distribution of a certain class of commodity is, I believe, the answer to a part of the question. The inspiration that would result from a few more successes like that of the Detroit manufacturer should be most beneficial.

Simply as a thought to indicate the direction toward which I feel we should be working, let us assume that in each trade territory there were but two stove manufacturers, each of whom had large productions, and each had but one dealer in each town in the territory. Who of us here believes he could not find dealers who would gladly take on one of those agencies and be satisfied with far less than a 40 per cent commission? Under such conditions a commission of 20 per cent would result in the dealer's earning a higher net return on his investment than a 40 per cent commission allows him under existing conditions of excessive competition.

You recognize, of course, I am simply saying that a small margin of profit on many sales can be made far more profitable than a larger margin of profit on a few sales. Too much competition on production and in distribution tends to make the production cost high and distribution expense high; the combination inevitably results in a high price to the public, for neither the maker nor the seller is running a charitable institution.

There are too many commodities which are being produced in too many factories, and are being distributed by too many agencies, for the best interest of the public. I feel that many of these could be made and marketed more economically if some advantageous mergers were effected or some failure took place. This would by no means solve all our troubles nor eliminate all the waste in merchandising; however, it would help considerably, for production is not done at low cost unless the output is reasonably large, nor can a jobbing business be conducted cheaply unless the units of sale are relatively large and frequent. Retailing can be done cheaply if the units of sale are small, provided enough units are sold.

I am sure you will not interpret my remarks to mean that I feel we should do away with competition in production and in distribution, for that is very far from my thought. It is competition and the will to excel among competitors which develops skill in a football team, so likewise it is the stimulating effect of competition which, more than any other factor, has and will continue to develop efficiency in our business enterprises.

Competition we need, but more of the efficient, waste-saving, cost-reducing competition is the sort we need. It is more businesses intelligently planned, adequately financed, and capably managed in each line of industry that are needed before management can hope to convince the great mass of our people that the waste incident to present methods of production and distribution has been eliminated.

Gypsum a Fire-Resisting Agent

A FIRE test at Tecumseh Park, Chatham, arranged during the convention of fire chiefs, demonstrated the effectiveness of gypsum materials as fire-resisting agents. One demonstration was carried on in a building erected by the Ontario Gypsum Co. with gypsum board on wood studding. It was filled with dry hay, wood oil, etc., and set on fire.

After the fire was allowed to take its course a stream of water was turned on it. Examination showed that outside of being blackened, the structure was in as good condition as when first erected. The gypsum board protected the studding which was uncharred. Fires were then placed on the roof and against the outside and allowed to burn themselves out. The gypsum construction proved to be entirely fireproof.

Cement Plant Seeks Federal Court Action

THE Black Hills Rock Products Co. has made answer to the condemnation proceedings instituted by the state of South Dakota to acquire the property wanted for the state cement plant at Rapid City.

The answer asks that the suit for condemnation of the proposed site be taken from the local courts and placed in the United States District Court. The petition was signed by W. T. Brown, secretary of the Rock Products Co. The commission had planned a meeting for November 10 to consider construction bids on file in the offices of the commission. These bids cover more than one-fourth of the total construction to be done. All plans were temporarily blocked by the action of the Rock Products Co.—*Improvement Bulletin.*

51,000 Open-Top Cars Released

Another modification provides for the use of cars with sides 48 in. high and less by shippers of sand, gravel, stone and other materials

By Edwin Brooker
Commerce Specialist and Statistician

THE Interstate Commerce Commission issued, effective at midnight, November 25, 1922, Amendment No. 3 to Service Order No. 25, making a further modification of the priority orders in effect east of the Mississippi river, releasing all open-top cars with sides of 48 in. and less, for movement of sand, gravel, stone and other materials requiring this class of equipment.

The proviso in paragraph 3 of Service Order No. 25 is changed to read as follows: "Provided, that the phrase, 'open-top cars suitable for loading and transportation of coal,' as used in this order shall not include or embrace flat (fixed) bottom gondola cars with sides 48 in. or less in height, inside measurement, or cars equipped with racks, or cars which, on July 1, 1922, had been definitely retired from service for the transportation of coal and stenciled or tagged for other service."

This change should give considerable relief to the producers of sand, gravel and crushed stone in the territory east of the Mississippi and north of the Ohio river. In this territory heretofore producers have been restricted to the use of open-top cars of 42 in. and less in height, and the use of coal equipment in the direction of the mines.

This amendment to Order No. 25 releases 50,700 open-top cars with sides over 42 in. up to and including 48 in. in height. The effect will be the use of these additional cars which may be shipped in any direction.

The greatest proportion of this class of cars are owned by railroads east of the Mississippi river. Statistics show the railroads having the greatest number of these cars to be as follows: Chicago and Eastern Illinois, 3265; Illinois Central, 10,168; Chicago and Alton, 1995; Chicago, Burlington and Quincy, 2010; Missouri, Kansas and Texas, 2200; Chesapeake and Ohio, 1906; Hocking Valley, 2278; Big Four, 717; Baltimore and Ohio, 1172; Pere Marquette, 1854; Kanawha and Michigan, 2164; Mobile and Ohio, 2844, and St. Louis-San Francisco, 5423.

While this modification comes late in the building season, it is indicative that the coal situation, as viewed by the authorities, is improving and that further lifting of the present restriction may be looked for soon.

It is unfortunate that relief could not be given sooner, but the winter months must be spent in devising ways and means of preventing a similar situation next spring. It will require united effort and finances to carry on a fight, and organizations who represent the users of open-top cars in the sand, gravel and stone industries should be supported in their attempt to take away from the authorities the power to issue such orders.

Transportation Problems

THROUGH the co-operation of Edwin Brooker, ROCK PRODUCTS will publish regularly itemized lists of propositions before the railroads covering proposed increases and reductions in rock products rates.

In this way ROCK PRODUCTS readers affected by such proposed actions will have an opportunity of taking action to protect their interests before the rates can be made effective.

Mr. Brooker is in a position to furnish additional information and to aid producers in either opposing changes or in securing their approval.

The following are current proposed changes covering the period for the last two weeks:

Central Freight Association.

No. 5481—Crushed Stone—Monroe, Mich., to Detroit, Mich. Present 70 cents. Proposed 60 cents per net ton.

No. 5491—Crushed Stone—Lima, Ohio, to various Ohio points, viz.: Present, to Millers City and Kiefersville, 80 cents; Continental, Hartzburg, Oakwood, Melrose, Goodwin, Broughton, Latty, 90 cents; Briceton, Worstville, and Payne, 100 cents per ton. Proposed 70 cents per ton.

No. 5507—Slag—Newcastle, Pa., to Titusville, Pa., $1.15 per ton; Youngstown, Ohio, to Titusville, Pa., $1.25 per ton.

No. 5508—Slag—Girard and Youngstown, Ohio, to Monnette, Ohio, $1.30 per net ton.

No. 5520—Crushed Stone—Annandale, Branchton, Harrisville, Osborne, and Wick, Pa., to Connellsville and Scottdale, Pa., $1.60 per net ton.

No. 5525—Sand and Gravel—Deeter, Ind., to Valparaiso, 125; Thomaston, 115; Knox, 105; Burr Oak, 105; Argos, 90; South Whitley, 90; Fort Wayne, Ind., $1.05 per net ton. From Warsaw, Ind., to Valparaiso, 115; Thomaston, 105; Knox, 105; Burr Oak, 90; Argos, 90; South Whitley, 90; Raber, 90, and Fort Wayne, Ind., $1.05 per net ton.

No. 5544—Sand and Gravel—West Pittsburgh, Pa., to Oil City and Franklin, Pa., building, $1.25, and Moulding, $1.39 per net ton.

No. 5554—Sand and Gravel—Urbana, Ohio, to Rosewood, Springfield, Lagonda, Thorps, Royal, South Charleston, South Solon, Blessings, Jeffersonville, Parrots, Heglers, and Washington Court House, Ohio, 80 cents per ton.

Illinois Freight Association.

No. 1544—Sand and Gravel—Alton, Ill., to Clayton, Timewell, Mt. Sterling, Hersman, Gilbirds, Versailles, Perry Springs, and Meredosa, Ill., $1.22, and to Bluffs, Ill., $1.13 per net ton.

No. 1379A—Moulding Sand—Vandalia, Ill., to Chicago, Ill., $1.76 per net ton.

Southern Freight Association.

No. 7824—Sand and Gravel—Montgomery, Ala., to Avondale, Bessemer, Boyles, East Birmingham, Ensley, Gate City, Grasselli, North Birmingham, Oxmoor, Pratt City, Ruffner, Thomas and Woodward, Ala. The Central of Georgia Ry. propose on account of their circuitous route and the low rates to cancel the present rates and withdraw from the handling of this traffic.

No. 7920—Sand and Gravel—Memphis, Tenn., to Alamo, Tenn., 8 cents per 100 lb.

No. 7945—Gravel for Road-Making Purposes—Golden, Miss., to Haleyville, 60 cents; to Jasper, 85 cents per net ton.

No. 8023—Slag—Copperhill, Tenn., to southern junction points. Present rates are on a combination basis and it is proposed to establish rates on basis of Georgia scale.

No. 8034—Sand and Gravel—Sheffield, Ala., to Nashville, Tenn., $1.40 per net ton, which is on the usual basis for establishing rates on this material via the Louisville and Nashville Railroad.

Southwestern Freight Bureau.

No. 86846—Sand, Gravel, Etc.—It is proposed to establish the following rule covering shipments between points in Oklahoma: Minimum weight 90 per cent of the marked capacity of the car, except when weight of shipment loaded to full visible capacity is less than 90 per cent of the marked capacity of car, the actual weight will apply, but in no case shall the minimum weight be less than 40,000 lb.

No. 6908—Sand, Gravel, Shells, and Crushed Stone—To provide an exception to the Western Classification, to the effect that class rates will not apply on these commodities between points in Texas and Louisiana on the Gulf Coast Lines and to permit rates to be applied on basis of combination of local rates.

Transcontinental Freight Bureau.

No. 3332—Crushed Stone—Porterville, Cal., to Waukegan, Ill., and St. Paul, Minn., on basis of 40 cents per 100 lb.

Trunk Line Association.

No. 10693—Crushed Stone—Ardsley, Edge Hill, Glenside, Lafayette, Laverock, Somerton, Spring Hill, and Wernersville, Pa., to Hespeler, Pulinsch, and Havelock, Ont., 26 cents per 100 lb.

No. 10710—Crushed Stone—Le Roy and Lime Rock, N. Y., to Elmira and Elmira Heights, N. Y., via P. & L. Jct., Leh. Val., $1.30 per net ton; via B. R. & P. and D. L. & W., $1.20 per net ton; via Erie R. R. direct, including switching charge, $1.20 per net ton.

No. 10720—Glass Sand—Goshen, Va., to Charleston, W. Va., $1.90, and to Huntington, W. Va., $2.10 per net ton.

No. 10730—Sand, Gravel, and Crushed Stone—Aggregates, W. Va., to stations on the Western Maryland Railway, Elkins, Kittanning, W. Va., Orchard and Frost, Md., etc. Rates 70 cents to $1.60 per net ton.

Western Trunk Line Committee.

No. 2801—Sand, Gravel and Crushed Stone—Proposed to publish all rates in cents per one hundred pounds in cases where now published on the per net ton basis.

State College Chemists Helps Cement Commission

THE chemistry department of the South Dakota State College has been designated analyst for the South Dakota cement commission and a large number of samples from borings for cement deposits in the Black Hills will be sent to the college for analysis.

Sand and Gravel Production in 1921

AS REPORTED to the United States Geological Survey, the production of sand and gravel in 1921 showed a decrease of 3 per cent from 1920 but was much larger than in any other year since 1916. There was a decrease in the quantity of sand and gravel used for every purpose except filtering and paving. Filtering sand increased 24 per cent, paving

Sand and gravel produced and sold in the United States in 1921, by States and uses, in short tons.

State.	Glass sand.		Molding sand		Building sand.		Grinding and polishing sand.		Fire or furnace sand.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Alabama			18,904	$16,743	205,984	$130,363				
Arizona					532	524				
Arkansas					143,744	113,769				
California	5,486	$12,721	14,949	28,075	1,522,843	1,130,207	418	$1,015	(a)	(a)
Colorado					70,178	52,832				
Connecticut			587	235	210,629	106,522				
Delaware			(a)	(a)	2,376	1,780	1,178	2,356	350	$875
District of Columbia					(a)	(a)				
Florida					79,799	43,843	1,700	1,105		
Georgia	3,904	4,489	12,605	11,364	211,707	104,694	1,500	1,095	(a)	(a)
Hawaii										
Idaho					5,625	4,500				
Illinois	259,889	406,632	309,180	352,857	2,015,749	1,101,105	55,615	119,648	(a)	(a)
Indiana	39,860	15,846	172,001	74,232	785,535	380,661	6,104	3,659		
Iowa			13,132	10,401	887,470	524,627	3,403	2,454		
Kansas			150	225	934,808	565,351				
Kentucky	(a)	(a)	42,861	52,656	409,027	370,748	(a)	(a)	(a)	(a)
Louisiana	1,800	1,350			237,277	126,794	(a)	(a)		
Maine					(a)	(a)				
Maryland	3,000	4,800	(a)	(a)	686,524	536,701	500	165		
Massachusetts	1,200	5,400	12,040	9,148	575,256	507,968	6,903	16,264	6,564	7,620
Michigan	33,424	106,886	96,545	25,576	822,791	515,338	(a)	(a)	(a)	(a)
Minnesota			13,049	12,936	579,067	351,976	3,343	11,253	1,318	896
Mississippi					20,251	4,751				
Missouri	(a)	(a)	32,699	37,589	669,621	366,439	(a)	(a)	(a)	(a)
Montana					1,689	3,234				
Nebraska			1,000	1,500	634,745	260,323	(a)	(a)		
Nevada										
New Hampshire					90,131	72,950				
New Jersey	103,694	196,814	241,587	306,209	1,426,327	627,232	49,479	132,351	20,292	30,252
New Mexico			213	160	21,469	16,142				
New York	(a)	(a)	288,354	447,481	3,818,671	1,815,086	(a)	(a)	21,240	34,640
North Carolina					155,187	70,458				
North Dakota					(a)	(a)				
Ohio	26,767	68,706	327,788	582,097	1,530,785	1,020,114	39,057	100,337	23,148	53,221
Oklahoma	14,200	28,400			279,233	172,937				
Oregon					224,424	245,377				
Pennsylvania	347,238	468,357	242,810	384,349	2,335,006	2,691,175	475,466	900,245	97,319	155,177
Rhode Island			4,648	8,968	(a)	(a)				
South Carolina					29,775	23,796				
South Dakota					44,184	35,184				
Tennessee	(a)	(a)	30,477	56,732	397,461	347,965	5,358	5,358		
Texas	13,178	24,314	160	96	486,854	345,566				
Utah					85,300	45,365				
Vermont			(a)	(a)	2,368	863	30,360	10,728		
Virginia	11,201	29,894	9,181	11,728	324,296	233,282	(a)	(a)	(a)	(a)
Washington			140	135	662,890	314,879				
West Virginia	303,130	747,845	(a)	(a)	302,833	382,869	16,294	20,558	(a)	(a)
Wisconsin	100	150	17,972	17,553	565,841	318,846	8,228	19,632	3,682	2,723
Wyoming					24,665	29,625				
Undistributed	112,288	191,710	3,945	2,921	40,678	33,031	205,764	118,676	30,742	34,373
	1,280,359	2,314,314	1,906,977	2,451,966	24,565,605	16,151,792	910,670	1,466,899	204,655	319,797

State.	Engine sand.		Paving sand.		Filter sand.		Other sands.		Total sand.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Alabama	1,000	$600	7,329	$4,840					233,217	$152,546
Arizona			123,930	92,948					124,462	93,472
Arkansas	2,600	1,200	75,726	69,697					222,070	184,666
California			313,877	183,414	(a)	(a)	4,192	$2,462	1,876,714	1,376,822
Colorado	21,326	17,377	8,120	5,220			979	218	100,603	75,647
Connecticut	2,084	833	11,583	4,633	33,250	$5,000			258,133	117,223
Delaware	(a)	(a)	(a)	(a)					43,954	25,337
District of Columbia	(a)	(a)	(a)	(a)					(a)	(a)
Florida	5,850	1,350	30,750	19,988	1,700	1,105			119,799	67,397
Georgia	9,057	3,741	58,944	41,059	(a)	(a)	608	608	(a)	(a)
Hawaii										
Idaho			37,500	18,750					43,125	23,250
Illinois	160,464	56,969	497,772	237,335	(a)	(a)	35,493	60,605	3,343,996	2,346,236
Indiana	87,380	34,019	597,359	326,058			35,464	16,445	1,723,703	850,920
Iowa	37,042	23,443	288,163	160,478	16,465	9,339	64,763	40,172	1,310,438	770,914
Kansas	16,766	9,780	54,863	29,164			(a)	(a)	(a)	(a)
Kentucky	10,615	8,440	44,842	39,759	(a)	(a)	(a)	(a)	524,205	496,707
Louisiana	(a)	(a)	64,710	34,034					306,103	163,728
Maine			(a)	(a)					15,291	11,683
Maryland	39,115	69,915	122,895	91,388			(a)	(a)	872,483	738,287
Massachusetts	60,937	(a)	47,904	32,611	3,504	6,003	(a)	(a)	720,844	662,179
Michigan	3,508	1,201	754,011	311,341			4,954	2,935	1,848,784	995,894
Minnesota	9,099	3,565	187,298	104,618	7,754	18,578	1,158	750	802,086	504,572
Mississippi	(a)	(a)	(a)	(a)			24,351	13,187	79,672	31,906
Missouri			90,374	35,848			2,700	1,836	975,570	712,627
Montana	(a)	(a)	11,183	9,863					(a)	(a)
Nebraska	(a)	(a)	15,858	11,208			9,490	2,918	663,712	276,529
Nevada										
New Hampshire	9,842	5,045	49,000	31,850					148,973	109,845
New Jersey	49,107	27,612	632,368	345,376	17,289	47,799	13,148	20,846	2,553,291	1,734,491

a Included under "Undistributed."

Sand and gravel produced and sold in the United States in 1921, by States and uses, in short tons—Continued.

State.	Engine sand.		Paving sand.		Filter sand.		Other sands.		Total sand.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
New Mexico	2,426	$1,824	266	$200	87	$74			24,461	$18,400
New York	85,575	77,934	230,883	173,519	5,772	5,574	69,799	$93,329	4,521,619	2,649,120
North Carolina	3,640	1,926	87,117	34,885					245,944	107,269
North Dakota									(a)	(a)
Ohio	44,273	36,533	645,457	511,696			28,161	21,309	2,665,436	2,394,013
Oklahoma	2,900	2,043	242,958	171,721			8,505	3,150	547,796	378,251
Oregon	(a)	(a)	118,474	115,302			20,727	20,637	(a)	(a)
Pennsylvania	298,328	392,621	776,633	655,627			24,182	27,082	4,596,982	5,674,633
Rhode Island			(a)	(a)					7,332	12,998
South Carolina	(a)	(a)	(a)	(a)					38,768	27,898
South Dakota	(a)	(a)	50,120	35,963			3,801	2,017	98,355	73,504
Tennessee	10,203	7,810	78,686	90,883			22,950	17,000	(a)	(a)
Texas	26,196	13,559	63,512	47,033			1,800	1,500	591,700	432,088
Utah	11,570	6,500					590	142	97,460	52,007
Vermont			(a)	(a)					36,989	13,490
Virginia	43,634	34,889	123,174	53,097	540	1,160	(a)	(a)	554,976	371,290
Washington	6,624	2,366	129,746	83,263			10,687	10,436	810,087	411,079
West Virginia	146,257	182,307	137,832	151,419					908,768	1,487,888
Wisconsin	32,560	8,547	620,675	331,265			59,909	45,030	1,308,967	743,746
Wyoming			1,995	3,375					26,660	33,000
Undistributed	32,761	84,538	95,635	52,247	17,553	20,953	42,102	51,880	2,301,426	1,744,843
	1,302,739	1,118,487	7,529,522	4,752,995	103,914	115,585	490,513	456,494	38,294,954	29,148,329

State.	Building gravel.		Roofing gravel.		Paving gravel.		Railroad ballast.		Total gravel.		Total sand and gravel.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity	Value.	Quantity.	Value.	Quantity.	Value.
Alabama	69,165	$98,643	1,000	$750	84,468	$29,097	386,766	$100,389	541,399	$228,879	774,616	$381,425
Arizona	1,125	800			257,580	193,205			258,705	194,005	385,167	287,477
Arkansas	79,635	67,644	1,050	1,550	704,580	409,220	456,672	119,732	1,241,937	598,146	1,464,007	782,812
California	1,402,671	1,175,591	4,702	7,300	791,492	575,936	628,635	113,430	2,827,500	1,872,257	4,704,214	3,249,079
Colorado	106,099	96,255	695	767	10,410	11,039	59,476	11,014	176,680	119,075	277,283	194,722
Connecticut	76,593	61,868	676	1,269					77,269	63,137	335,402	180,360
Delaware					4	10			4	10	45,958	25,347
District of Columbia					(a)	(a)			(a)	(a)	(a)	(a)
Florida					40,646	29,933			40,646	29,933	160,445	97,324
Georgia	(a)	(a)					26,000	8,500	(a)	(a)	329,048	177,745
Hawaii					(a)	(a)			(a)	(a)	(a)	(a)
Idaho	28,000	11,202			195,728	72,548			223,728	83,750	266,853	107,000
Illinois	1,272,413	799,419	53,391	28,239	875,209	547,206	914,683	295,706	3,115,696	1,670,570	6,459,692	4,016,806
Indiana	671,810	411,533	15,944	13,142	1,789,304	1,093,191	1,076,743	412,513	3,553,801	1,930,379	5,277,504	2,781,299
Iowa	333,097	282,771	10,390	13,893	595,229	548,576	392,828	110,804	1,331,544	956,044	2,641,982	1,726,958
Kansas	19,917	9,190	150	475	25,352	26,228	(a)	(a)	(a)	(a)	1,082,914	647,723
Kentucky	(a)	(a)	(a)	(a)	288,633	154,106	286,671	92,190	(a)	(a)	1,356,512	963,584
Louisiana	414,099	496,972			1,056,526	788,463	44,967	42,243	1,515,592	1,327,678	1,821,695	1,491,406
Maine	14,967	14,556			10,626	10,120			25,593	24,676	40,884	36,359
Maryland	534,389	717,845			136,581	136,603			670,970	854,448	1,543,453	1,592,735
Massachusetts	354,479	483,360	22,243	44,152	19,096	9,293	5,292	2,457	401,110	539,262	1,121,954	1,201,441
Michigan	1,306,010	827,410	7,684	2,694	2,103,187	1,129,506	249,588	59,792	3,666,469	2,019,402	5,515,253	3,015,296
Minnesota	352,543	300,805	32,697	35,042	466,987	291,581	9,507	3,042	861,734	630,470	1,663,820	1,135,042
Mississippi	164,950	117,969			1,517,583	805,159	693,200	228,163	2,375,733	1,151,291	2,455,405	1,183,197
Missouri	357,517	218,967	1,279	830	44,210	22,888	160,497	63,013	563,503	305,698	1,539,073	1,018,325
Montana	4,986	7,184			49,731	59,095	(a)	(a)	(a)	(a)	68,377	79,812
Nebraska	(a)	(a)	(a)	(a)	338,069	248,385	14,526	2,721	355,280	252,689	1,018,992	529,218
Nevada	10,856	3,008					142,429	31,854	153,285	34,862	153,285	34,862
New Hampshire	43,922	98,695			165,743	90,200	9,924	4,736	219,589	193,631	368,562	303,476
New Jersey	698,929	554,449	(a)	(a)	314,952	146,030	(a)	(a)	1,015,489	701,807	3,568,780	2,436,206
New Mexico	43,419	25,381	(a)	(a)	6,151	3,618	(a)	(a)	302,884	150,495	327,345	168,895
New York	1,199,441	776,861	2,114	2,735	234,126	217,494	63,929	26,917	1,499,610	1,024,007	6,021,229	3,673,127
North Carolina	106,135	151,609			104,190	127,056	255,113	99,900	465,438	378,565	711,382	485,834
North Dakota											(a)	(a)
Ohio	683,841	574,148	41,981	32,324	903,809	717,980	843,209	342,021	2,472,840	1,666,473	5,138,276	4,060,486
Oklahoma	162,694	129,319			169,595	177,937	(a)	(a)	334,053	308,256	881,849	686,507
Oregon	195,897	162,725	(a)	(a)	640,272	492,576	147,812	36,890	(a)	(a)	1,351,425	1,079,815
Pennsylvania	1,068,851	1,097,768			957,125	814,799	17,376	13,511	2,043,352	1,926,078	6,640,334	7,600,711
Rhode Island	3,426	1,657	(a)	(a)	(a)	(a)			4,032	2,592	11,364	15,590
South Carolina	29,417	17,650			121,316	59,709	141,168	49,404	291,901	126,763	330,669	154,661
South Dakota	(a)	(a)			(a)	(a)	31,426	5,589	(a)	(a)	185,659	136,152
Tennessee	151,214	123,575	(a)	(a)	360,676	254,140	(a)	(a)	(a)	(a)	1,095,114	930,767
Texas	697,520	579,060	11,756	14,730	717,474	464,540	952,118	357,323	2,378,868	1,415,653	2,970,568	1,847,741
Utah	107,997	48,037			49,600	21,780	272,346	41,120	429,943	110,937	527,408	162,944
Vermont	282	40			1,481	210			1,763	250	38,752	13,740
Virginia	321,696	433,610	500	1,125	127,594	128,456	43,527	24,106	493,317	587,297	1,048,293	958,527
Washington	160,950	116,950	630	450	413,739	328,110	96,168	25,253	671,487	470,763	1,481,574	881,842
West Virginia	256,714	312,704			209,197	238,450			465,911	551,154	1,374,679	2,039,042
Wisconsin	345,050	234,693	9,438	7,236	1,189,469	777,956	46,885	19,547	1,590,842	1,039,432	2,899,809	1,783,178
Wyoming	23,970	9,018			3,598	5,742	164,746	33,169	192,314	47,929	218,974	80,929
Undistributed	307,136	267,687	10,482	13,315	96,818	106,482	315,047	151,947	2,698,243	1,845,552	153,200	145,008
	14,183,822	11,918,628	228,802	222,018	18,188,156	12,364,653	8,949,274	2,928,996	41,550,054	27,434,295	79,845,008	56,582,624

a Included under "Undistributed."

sand 27 per cent, and paving gravel 38 per cent.

The total value of all the sand and gravel produced in 1921 was $56,582,624, as compared with $65,661,605 in 1920.

According to reports the producers could not supply the demand for sand and gravel in 1920 because of the car shortage, whereas in 1921 with more cars available the demand was not so great. The smaller demand, according to the reports of most producers, was due to high freight rates. As a result of the high rates many companies shipped by water and more by truck, and many roadside pits were opened during the year.

SAND AND GRAVEL PRODUCED AND SOLD IN THE UNITED STATES, 1919-1921, BY KINDS, IN SHORT TONS

Kind—	1919	1920	1921
Glass sand	1,827,409	2,165,926	1,280,359
Molding sand	3,774,612	5,128,075	1,906,977
Building sand	21,969,736	26,539,365	24,565,605
Grinding and polishing sand	988,240	1,132,810	910,670
Fire or furnace sand	355,458	400,953	204,655
Engine sand	1,481,481	1,754,897	1,302,739
Paving sand	4,431,306	5,920,328	7,529,522
Filter sand	58,342	83,983	103,914
Other sands	1,083,152	649,805	490,513
Railroad ballast	8,715,842	9,081,815	8,949,274
Gravel (exclu. of railr'd ballast)	25,890,829	29,183,431	32,600,780
	70,576,407	82,041,388	79,845,008

Imports and Exports

A considerable quantity of the sand imported is brought into the country as ballast; a certain quantity is building sand brought in from Pelee Island, which is across the Canadian boundary in Lake Erie. White sand is imported from Belgium for the glass-making industry on the Pacific coast.

SAND IMPORTED FOR CONSUMPTION IN UNITED STATES, 1919-1921

Year—	Short tons	Value— Total	Average
1919	597,481	$126,586	$0.21
1920	1,226,684	912,282	.74
1921	906,905	771,734	.85

The value of the sand exported in 1921 showed a decrease of 43 per cent as compared with 1920. Canada receives most of the sand exported, and the value of that shipped to Canada in 1921 was less than half that shipped in 1920. The increase in the value of the sand shipped to Mexico in 1921 was 153 per cent. It is not known for what purposes the exported sand was used.

VALUE OF SAND AND GRAVEL EXPORTED FROM THE UNITED STATES, 1919-1921

Destination—	1919	1920	1921
Canada	$347,578	$583,574	$247,895
Mexico	14,803	38,402	97,342
Panama	4,650	13,307	8,600
Japan	3,091	6,758	4,072
England	967	6,161	3,718
Cuba	2,438	10,746	7,285
Newfoundland	279	1,418	854
Brazil	40	66	622
China	130	833	1,301
Argentina	712	58	
Other countries	7,382	8,622	8,293
	$382,070	$669,945	$379,982

General Decrease in Prices

There was a general decrease in prices of sand and gravel used for various purposes in 1921, although the prices are still higher than they were in 1919.

AVERAGE PRICE PER SHORT TON OF SAND AND GRAVEL PRODUCED AND SOLD IN THE UNITED STATES, 1917-1921

(Based on prices realized for sales f.o.b. pits or nearest shipping points)

Kind—	1917	1918	1919	1920	1921
Glass sand	$1.38	$1.94	$1.97	$2.19	$1.8'
Molding sand	.92	1.04	1.10	1.46	1.29
Building sand	.39	.50	.56	.68	.66
Grinding and polishing sand	1.04	1.60	1.34	1.80	1.61
Fire or furnace sand	1.15	1.48	1.23	1.81	1.56
Engine sand	.59	.76	.77	.82	.86
Paving sand	.41	.54	.66	.68	.63
Filter sand	.76	1.47	1.48	1.27	1.11
Railroad ballast	.17	.22	.30	.32	.33
Gravel (exclusive of railroad ballast)	.46	.57	.66	.81	.75
All kinds	.46	.61	.65	.80	.71

Production of Glass Sand

The production of glass sand in the United States decreased 41 per cent in 1921. Pennsylvania, West Virginia, Illinois, Missouri, and New Jersey produced 88 per cent of the total quantity of glass sand in 1921. These states are named in the order of their production. The average price per ton of the glass sand sold in Pennsylvania was $1.35, West Virginia $2.47, Illinois $1.56, New Jersey $1.90. In Massachusetts the average price was $4.50 and in Michigan $3.20.

GLASS SAND PRODUCED AND SOLD IN THE UNITED STATES, 1916-1921

Year—	Short tons	Value— Total	Average
1916	2,018,317	$1,957,797	$0.97
1917	1,942,675	2,685,014	1.38
1918	2,172,887	4,209,728	1.94
1919	1,827,409	3,593,371	1.97
1920	2,165,926	4,748,690	2.19
1921	1,280,359	2,314,214	1.81

LOCALITIES WHERE GLASS SAND WAS REPORTED AS PRODUCED IN 1921

California—Ione, Lake Majella.
Georgia—Lumber City.
Illinois—Millington, Oregon, Ottawa, Utica.
Indiana—Michigan City.
Kentucky—Lawton.
Louisiana—Le Blanc.
Maryland—Hancock.
Massachusetts—Cheshire.
Michigan—Rockwood.
Missouri—Crystal City, Gray Summit, Klondike, Pacific.
New Jersey—Cedarville, Clayville, Milltown, Millville, Pembryn, South Vineland, Williamstown Junction.
New York—Cleveland.
Ohio—Austiintown, Chalfants, Millwood, Toboso.
Oklahoma—Hickory, Roff.
Pennsylvania—Althom, Daguscahonda, Dunbar, Falls Creek, Kennerdell, Lewistown, Mapleton Depot, Parrish.
Tennessee—Siam.
Texas—Haiduk, Santa Anna.
Virginia—Kermit, Mendota.
West Virginia—Berkeley Springs, Great Cacapon, Greer, Hancock, Imperial, Sturgisson, Thayer.
Wisconsin—Portage.

Molding Sand Output Decreases

The output of molding sand decreased 63 per cent in comparison with the production in 1920. Named in the order of their output, Ohio, Illinois, New York, Pennsylvania, New Jersey, and Indiana supplied 83 per cent of the molding sand produced. The average price per ton varied greatly in different localities. The average in Ohio was $1.78, Pennsylvania $1.58, New York $1.55, New Jersey $1.27, Illinois $1.14, and Indiana 43 cents.

IN 1921 this product showed a decided increase of 3 per cent from 1920. The smaller demand was due to high freight rates according to the producers. This report is written by L. M. Beach and is incorporated in the work of the U. S. Geological Survey, "Mineral Resources of the United States, Part II," and published November 6, 1922. The total value was $56,582,624.

MOLDING SAND PRODUCED AND SOLD IN THE UNITED STATES, 1916-1921

Year—	Short tons	Value— Total	Average
1916	4,662,649	$3,219,839	$0.69
1917	4,660,968	4,303,809	.92
1918	4,910,178	5,121,865	1.04
1919	3,774,612	4,153,990	1.10
1920	5,128,075	7,504,759	1.46
1921	1,906,977	2,451,966	1.29

Sands for Other Uses

More than 490,000 tons of sand was reported as sold for uses other than those specified in the foregoing tables. Of this quantity over 28,000 tons was sold for fertilizer filler, at an average price of $1.55. About 17,000 tons was sold for bedding stock cars, at a price of 42 cents. A small quantity is reported each year as sold for standard testing sand.

National Agricultural Limestone's Cleveland Meeting

AT THE Cleveland meeting of the National Agricultural Limestone Association, on December 5, discussion will be had of next year's policy and program. Secretary Sandles urges that every member attend.

Sources of Hard-Water Supply

SERIOUS trouble is encountered in the industrial use of hard water, states W. D. Collins head of the U. S. Quality of Water Division, in a paper read at Philadelphia recently. Large amounts of money are spent annually in softening hard water for industrial use and in repairing damages resulting from the use of unsoftened hard water.

Analyses of water from the public supplies of over 300 large cities in the United States show that the average hardness of the surface water supplies in parts per million is 85 and of the ground water supplies is 226. Surface supplies are used by 34,000,000 of the 39,000,000 inhabitants of these cities. The general average hardness for all supplies is therefore 99 parts per million.

The hardness of some of the larger supplies is much below the average. The Boston supply, the Catskill supply of New York City, and several smaller supplies have hardness of less than 25 parts per million. The Croton supply of New York City and the Delaware river supply of Philadelphia have hardness of about 50 parts per million.

The hardness of the water from Lake Michigan used in Chicago is about 130 parts per million. Other cities on Lake Michigan and the other Great Lakes use water with about the same hardness.

The average hardness of the large water supplies of states along the Atlantic coast and the east Gulf of Mexico is less than 55 parts per million except for Florida. The average hardness of the four large supplies of Florida is 296, although the hardness of the Pensacola supply is only 3. Public supplies in the central states are nearly all hard or very hard. A number of them are softened in connection with their filtration for sanitary purification.

This Year's Highways to Cost $742,000,000

FEDERAL aid highways completed in the last fiscal year comprise 10,000 miles, forming a new record, it is announced by the Bureau of Public Roads of the Department of Agriculture. The total mileage now is 19,308.

A total of $742,000,000 will be spent in the United States this year on highways, according to estimates of the bureau. This figure includes not only the cost of federal aid highways, but of other roads built by states, counties and municipalities without federal help.

In addition to the 10,000 miles of federal-state highways, 1352 miles of roads have been completed by the Bureau of Roads in the national forests and 617 miles more are to be built.

Stripping Problems in Shenandoah Valley Limestone Quarries

By Oliver Bowles
(Mineral Technologist), U. S. Bureau of Mines

THE United States Bureau of Mines has recently undertaken a study of limestone quarrying for lime manufacture, in connection with which a series of short papers on various phases of the industry will be issued. The present report is the first of this series.

Solution Cavities

The limestones of the Shenandoah Valley of Virginia and West Virginia are characterized by numerous solution cavities brought about by surface or subterranean stream erosion. Some form extensive caverns in which part of the dissolved calcium carbonate (limestone) has been redeposited as stalactites and various other ornate forms. Some of the caverns have been illuminated and opened to the public as commercial enterprises. In a few instances the cavities constitute a commercial asset in the valley, yet from the quarryman's point of view they are a decided disadvantage, for they constitute one of his hardest problems.

Clay Seams and Pockets

The quarryman's difficulty is due to the occurrence, even at considerable depth, of erosion cavities, not in the form of open spaces, but filled with red clay. These clay masses are troublesome, and their removal is costly. The problem is of general interest to all limestone quarrymen, for erosion cavities are characteristic of limestone deposits though they are not generally developed as much as in the district under consideration. In many quarries throughout the valley the stripped rock surface is very rugged, consisting of knobs or spires of rock with irregular cavities or cracks between them. Solution has not only honeycombed the surface, but it has followed joints or other planes of weakness, and thus has dissolved out seams or pockets many feet in depth. Masses of clay from 30 to 60 ft. in width have been observed 80 ft. below the rock surface.

Necessity for Separation of Clay

In general the clay pockets are very numerous at the surface, and are absent or greatly reduced in size at depths of from 10 to 20 ft. Thus the bulk of the clay is usually found in the upper 6 to 12 ft. of the rock mass; in many quarries this upper zone contains as much clay as rock, or the clay content may exceed that of the rock.

Clay is a hydrous silicate of aluminum, hence if clay is burned with the limestone, a lime contaminated with alumina and silica results. For certain uses a limited percentage of such impurities is permissible, but for most purposes a high degree of purity is demanded. It is apparent therefore that a clean separation is required, and owing to the large proportion and irregular occurrence of the clay such separation is surrounded by many difficulties.

THE purpose of these reports is to discuss conditions, methods, and equipment in order to promote high efficiency and safety in the operation of the quarries. It is highly desirable that quarry operators and superintendents study these reports carefully, and supply the Bureau of Mines with any criticisms or suggestions that may assist in a proper solution of the problem. The bureau's representative has observed many quarries in widely separated localities, but undoubtedly a more comprehensive and helpful final report can be prepared if his observations are supplemented by suggestions from practical men who are actively employed in quarry work.

It is urgently requested therefore that any reader of this report who has had experience in quarrying will write to the bureau giving any constructive criticisms, changes, or corrections that may suggest themselves to him.

General Methods of Removal

Two general methods are followed in removing the clay. The greater part of it may be stripped back before the ledge is blasted down, or clay and rock may be shot down together and separated later at the quarry floor. The first method is usually followed where a foot or more of solid clay lies above the highest points of rock. Where numerous knobs or ridges of rock are exposed at the surface, the difficulty of digging the clay from between the rock masses commonly results in the quarryman's following the second method—that of blasting down rock and clay together, and separating them while loading.

Merits of the Two Methods Considered

Where a large volume of clay occurs free enough from rock masses to permit the use of such mechanical equipment as the steam shovel or dragline scraper, it is undoubtedly wiser to remove as much as possible of the clay before blasting down the rock. If the rock surface is so extremely rugged that it is advisable to use hand tools only, the relative merits of the two methods are more difficult to judge. If rock and clay are shot down together, the intimate mixture makes separation slow and difficult. In rainy weather the clay adheres to the rock fragments, and the quarrying of clean rock becomes impossible.

On the other hand, in cleaning out the pockets before blasting the clay is fairly free of loose rock fragments and the rock subsequently shot down is clean in either wet or dry weather. In loading dirt at the quarry floor, however, the laborer is required to lift it only high enough to clear the edge of the quarry car; in cleaning out pockets from the surface clay must sometimes be raised from 10 to 20 ft. Loading in the quarry is also much more rapid, as the clay is loose, whereas the firm, undisturbed clay in the pockets may require excessive use of the pick or may even require blasting; thus its removal is slow and expensive.

The High Cost of Hand Loading

Hand loading of clay is laborious, slow, and costly. This fact is recognized by most quarry operators, but owing to the peculiar conditions in the Shenandoah valley the method is still widely used. The cost of loading dirt at the quarry floor in 1922 varies from 15 to 25 cents per cubic yard. Hand loading of clay at the surface varies from 30 to 45 cents a yard. The latter figure applies to direct loading of clay from the bank to the car or dump cart. The cost may be much higher where the clay is removed from deep cavities. At one quarry four men shoveled the same masses of clay to successively higher benches, and the fifth man loaded it into a dump cart. Under such conditions the cost might reach $1 or $1.50 per yard. Owing to the excessive cost of hand loading, and its wide employ-

ment in the valley, the Bureau of Mines, though recognizing the difficulties to be overcome, urged upon operators the desirability of seeking more efficient methods. Improved methods now employed or proposed are discussed in the following paragraphs.

The Hydraulic Method

Hydraulicking is one of the most efficient methods yet devised for the removal of overburden. Water is pumped at high pressure and is directed against the bank through a special nozzle. The method, however, is limited in application, as certain specific conditions must be met.

First, there must be an adequate water supply.

Second, the quarry must have proper drainage.

The most favorable condition is where the natural drainage is back from the face so that the soil may be washed away in some ravine, or other depression, where no further handling is required. In exceptional cases the soil may be carried toward the quarry face. In a quarry near St. Louis, Mo., hydraulic stripping has been successfully employed where the soil is carried across the quarry to the river by aqueduct. At a cement plant in Virginia the clay is washed to the quarry floor, where it is later loaded by steam shovel and removed in cars.

It is unlikely that the hydraulic method can be employed profitably except in shelf quarries where automatic drainage carries off the water used in stripping.

A third condition to be met is the availability of a suitable settling basin where the soil may be disposed without covering adjacent property or contaminating streams on which other industries depend.

The hydraulic method has been used with success in the Shenandoah Valley, the cost of soil removal being not more than 12½ cents per cubic yard. The bureau has a record of a hydraulic stripping cost at a marble quarry in Tennessee, in 1916, of only 2 cents per cubic yard. In the gold districts of California where some years ago hydraulic mining was widely used the cost of handling gravel was about 2½ cents per cubic yard. As the actual gold value in much of the gravel did not exceed 3 to 5 cents per cubic yard, the cost of hydraulicking must have been kept considerably below this figure. At one of the large iron mines in Minnesota very extensive hydraulic stripping was conducted about 1914 at an average cost of 6.7 cents per cubic yard, including upkeep and office expense. In the Florida phosphate fields hydraulic stripping of fine overburden cost 5 to 8 cents per cubic yard in 1912. In the Tennessee brown phosphate fields hydraulic stripping some years ago cost about 7 cents per cubic yard. At a Missouri cement plant quarry visited by the writer in 1916 the hydraulic stripping cost, including blasting of hard soil, was about 7 cents per cubic yard. Under 1922 operating costs these figures should be increased approximately 50 per cent.

Equipment Used in Stripping

A dragline excavator operated from a derrick arm has been used successfully in cleaning out clay pockets in Pennsylvania. The entire equipment is on a portable mounting, and the excavated material is loaded on cars just as when a steam shovel is employed. It cleans out shallow depressions fairly well, but some hand work is required in the deeper cavities. The lateral motion of the derrick arm gives the excavator a wide range and great flexibility of movement.

The simple form of dragline scraper may be used where a convenient dumping ground is available. Though some convenient devices for shifting the sheave attachment have been devised in general this scraper lacks flexibility in lateral motion. Its use at limestone quarries has not yet been observed by the writer.

A clamshell bucket operated from a derrick arm or crane has been used to a limited extent in moving soil overburden. Its usefulness in removing clay from erosion cavities is not yet established, and further information is desirable.

A small tractor excavator widely used in road grading has been employed with success on eroded limestone surfaces in Pennsylvania. The dipper slides back and forth on an arm 12 or 14 ft. in length, which may be raised and swung aside for dumping into cars or wagons. The excavator is so equipped that the dipper may be lowered into a pit, loading as it is elevated toward the surface. Such an adaptation permits it to be used in cleaning out clay pockets.

Steam Shovel Uses

Several operators in the valley have used steam shovels with success on very uneven surfaces. Rock projections so interfere with continuous operation that great patience is required, and the operator must be prepared for much lost time both in loading and in moving. The shovel will not excavate from deep pockets, hence much hand work must follow, but where a depth of several feet of clay is encountered the steam shovel is much more economical than hand loading. The smaller types of tractor, or caterpillar shovels with dippers not more than ¾ yd. in size, are best adapted for such work.

The actual cost of steam-shovel stripping varies greatly in different localities. In the Florida phosphate fields the contract price for steam shovel stripping was 20 cents per cubic yard in 1912. At several cement plant quarries visited by the writer in 1916 and 1917 the cost of steam shovel stripping varied from 11 to 16 cents per cubic yard, including transportation to the dump. The Dolomite Products Co. of Cleveland, Ohio, in substituting a steam shovel for hand loading of soil overburden found that the daily cost of handling the same amount of material was reduced from $137.50 to $35 per day.

An interesting modification in the use of the steam shovel has been proposed, but has not yet been tried. It is suggested that rock and soil be blasted down together, the serviceable stone sorted out and removed, and a steam shovel employed to clean up the soil and waste on the quarry floor. All good stone in the waste material could be thrown aside while loading. The adherence of mud to the rock during rainy weather is a disadvantage, but as waste is much more slowly loaded than good rock by hand methods, the proposed scheme has some merit.

A method now being tried in the valley, and which according to report has been successfully used elsewhere, involves the use of the steam shovel for both rock and clay in the upper part of the deposit. The great bulk of the clay in pockets and seams is usually confined to the upper 6 to 12 ft. of the limestone deposit; thus if a cut 6 to 12 ft. deep is made, the clay may be loaded into cars with a small tractor shovel having a ½-yd. dipper, and the rock masses drilled and blasted as they are encountered. The rock thus obtained may be loaded into separate cars—but it is not deemed advisable to do so for it is difficult, if not impossible, to load clean rock with a steam shovel where rock and soil are mixed. As now conducted, the surface cut is at the margin of the quarry excavation, and all rock masses encountered are thrown over the edge where they are loaded at the quarry floor. This makes possible a clean separation of rock and soil.

The method as thus briefly outlined is one of the most promising yet proposed, for it permits removal of almost the entire mass of clay with the steam shovel and leaves the underlying limestone ledge relatively clean and well prepared for ordinary methods of quarrying.

Steam Shovel with Washing and Screening Plant

One operator plans to erect a washing plant, and in the writer's opinion this is the best solution of the stripping problem in large quarries. Small operators probably could not employ such equipment profitably, but where 250 tons or more of rock are quarried per day there is no evident reason why a washing and screening equipment could not be employed with profit. Most operators will admit that with present high wages the steam shovel is far more efficient than hand methods for loading either rock or soil. The great weakness of the steam shovel is its inability to sort the materials that it loads, and hand methods are employed because it is necessary to sort the stone according to size, and to separate it from the clay. The washing and screening equipment accomplishes the necessary sizing and purification of the rock, and thus permits steam shovel loading. Where a heavy overburden is encountered, the bulk of the

material may be stripped separately as a preliminary operation, but all clay that occurs in close association with the rock may be separated in the washing plant.

At one lime plant in Pennsylvania the rock is all loaded with steam shovels, passed through a jaw crusher with an 8-in. opening and carried in a pan conveyor to a rotary screen. The larger sizes are conveyed to the kilns and the smaller sizes to railroad cars for flux or road work. With the addition of nozzles and other necessary equipment to wash the stone during its passage through the rotary screen, this type of plant would be ideal for rock mixed with clay, as in the valley region. It would also prepare the way for better utilization of the smaller sizes of stone, materials which are now mostly mixed with soil and thrown away as waste.

Removal of Clay from Deep Erosion Cavities

Occasionally clay-filled cavities of large size are encountered. In one quarry in Virginia a mass of clay 60 ft. across reached to the bottom of an 80-ft. excavation. On account of the slow hand methods employed its removal seriously curtailed the output of the plant for two years. Obviously it would have been easy for a steam shovel, operating on the quarry floor, to remove such a mass in a few weeks.

Deep erosion cavities often occur in places where it is difficult or impossible to employ ordinary mechanical methods of removal. Several instances have been observed where a succession of laborers shovel the clay from bench to bench until it is finally thrown to a point from which it can be loaded into cars or dump carts. Such methods date back to antiquity and involve a labor charge that is prohibitive under modern wage condition. If a clamshell bucket, dragline excavator or similar device cannot be employed, it is suggested that the soil be mechanically elevated by means of some type of wagon-loading equipment now so generally used. A portable belt or bucket elevator is easily placed in position, and may be operated at low cost by electric motor or gasoline engine. With such simple equipment two men could easily do the work of six or seven.

Underground Methods

One operator has solved the stripping problem simply and effectively by removing the lower ledges of high grade limestone without disturbing the overlying inferior rock and clay. From the quarry wall an entry is driven into the ledge, and drifts are projected right and left. Certain disadvantages are connected with mining limestone and the method is to be recommended only where a sound roof is obtainable and where an excessive thickness of soil or waste rock overburden is encountered.

Summary

As a result of his observations, the writer concludes that removal of the overburden is unusually difficult in limestone quarries in the Shenandoah valley, and that stripping expense is consequently one of the chief items of quarry cost. It would be very helpful to the bureau to obtain from operators who have the data definite figures showing the proportion stripping costs bear to total quarry cost.

The writer is convinced that if mechanical means of removing the overburden were more generally employed the stripping expense would be greatly reduced. Stripping costs in the valley by hand methods vary from 20 to 45 cents per cubic yard for average conditions and are very much higher where clay removal is exceptionally difficult. The cost of hydraulic stripping varies from 3 to 11 cents per cubic yard, while steam shovel operation costs from 16 to 30 cents per cubic yard.

A decision as to the best methods and types of equipment to be used in stripping is open for discussion, and it is hoped that many operators will act upon the suggestion that they submit their ideas to the Bureau of Mines.

Liner Rings and Loose Refractory Materials as Substitute for Brick*

THE use of ganister for lining up converters, instead of building them out with fire brick is as old as the Bessemer process itself, and finds a counterpart in cupola melting practice in the placing of slabs of mica-schist where brick would ordinarily be used in patching up the melting zone region of this furnace. This ganister is a crushed highly silicious rock to which about 2 per cent of lime has been added for a binding material, the mass wetted down, rammed in place, dried and then burned at a very high temperature. The lining thus becomes a solid mass which can be readily patched up and is good for a long campaign before requiring replacement in its entirety.

Of late, the use of loose refractory materials rammed into place for furnace linings in the crucible process has found a place in this country, but a direct application to the cupola—to replace the fire brick and blocks now employed—would seem new to us here. References to this matter have appeared from time to time in the foundry literature of Germany, and advertisements of suitable materials in loose form, for ramming up the cupola lining appear regularly, the largest concern delivering about 10,000 tons a month to the foundry trade.

In Die Giesserei, the journal of the organization which corresponds to the national founders' association of Germany, an article was recently published on this subject by a foundry engineer named Kark Grocholl of Breslau, who advocates the use of his patented adjustable liner rings in place of the usual block patterns which may be either solid or split, and which are moved upward in the cupola as ramming up the lining proceeds.

Grocholl states that the cost of fire brick is 30 times as high as this new refractory material, which doubtless is a silica sand mixed with a little lime or clay, or both. The results obtained have proved so good that the near future may see the discarding of all brick and blocks now used. In his foundry, he rams up the lining from the bottom to the charging door with this loose material, and finishes up the top of the cupola with a hollow cast iron circular cupola block. No fire brick or blocks are used at all, and the experience of four years of this practice has shown it highly economical. Patching is done after every heat and a relining is not necessary within two or more years. Even then much of the lining is left intact. Particular attention is called to the fact that common labor only is necessary for lining up the cupola, no skilled craftsmen being used.

The article in question gives illustrations of the several kinds of cupola interiors current in German melting practice. These are omitted here as only one of them—the straight, uniform-diameter lining can be recommended. Grocholl is undoubtedly right in preferring an adjustable liner ring of steel to the wooden solid or split pattern block that must be unwieldy within the cupola, and when jarred loose and upward do some damage to the freshly made lining.

The subject is recommended to the attention of the refractories trade, and the production of a suitable refractory loose material which will have minimum change in volume under the high temperatures of the cupola melting zone, which will stand abrasion well, and only flux sufficiently to resist disintegration, should be possible of production. The disagreeably high item of new brick brought to the cupola daily in some foundries will then be much reduced and a substantial cut in the annual cost for this charge effected.

*Abstracted from the German by Dr. Richard Moldenke, Watchung, N. J., by *Iron Age*.

Element Sodium Is Widely Distributed

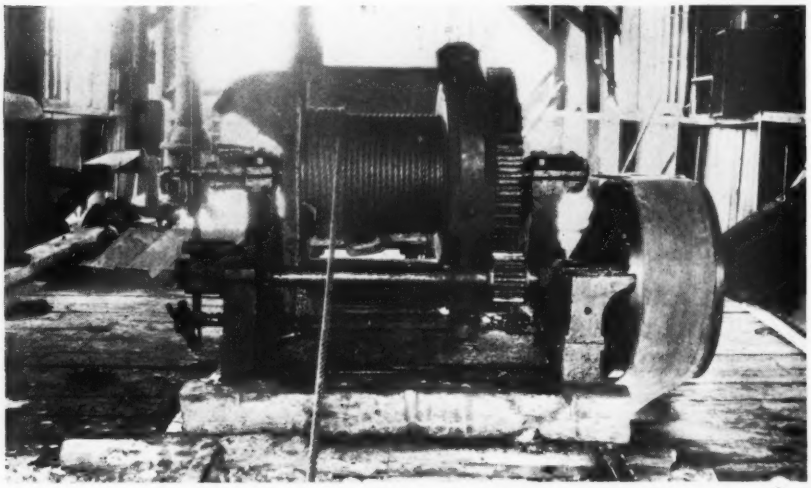
THE element sodium is very widely distributed in the earth. It forms about 2.36 per cent of known terrestrial matter, according to the United States Geological Survey, and is the most abundant of the alkali metals. Sodium appears to occur in nature only in combination with other elements, if its alleged occurrence as the free element in blue rock salt is neglected. It is an important constituent of the feldspars and several other insoluble minerals from which sodium salts are not extracted commercially, but which are nevertheless regarded as the ultimate source of the salts that are soluble in water.

Hints and Helps for Superintendents

A Hoist Converted from Steam to Electricity

THE illustration shows a derrick steam hoist that has been converted into an electrically powered incline hoist at the Martinsburg, W. Va., plant of the Kelly Island Lime and Transport Co.

In making the conversion it was necessary to remove the cylinders and lower the drum and the snub pulleys. One of the latter was replaced with a 22-in. iron pulley and connected to a 35-hp. motor by an 8-in. belt. The same friction clutch is used for controlling the hoist as was used when it was steam-powered.



An inexpensive electrically powered incline hoist

The company has found the installation to be satisfactory in that it is more dependable, faster, and less expensive than the steam hoist. Two 4-yd. cars are pulled up the incline at a time.

Self Closing Loading Spouts

THE recently completed crushing and screening plant owned and operated by H. E. Millard, near Myerstown, Pa., has as one of its features truck-loading spouts of simple construction that do not require the usual efforts to operate.

As may be seen in the illustration, the spouts are made of 10-in. pipe, the discharge end being provided with a lip on its under side to add force to the discharge. A hinged gate, secured to the spout approximately 8 in. from the end, is shaped to fit into the curve of the bottom of the spout, so that when closed, the smallest particle of stone cannot be discharged. Leverage is obtained by a 20-in. rod attached to the back of the gate. From this lever is suspended a rod extending within close reach of the loader.

This type of spout is worth while not only for its easy operation but also because it cannot be left open by accident, as the weight of the gate is sufficient to cause it to close itself when the operator releases the lever.

These spouts close automatically

The company is assured of long service from the spouts as they are constructed of heavy steel plate and are attached to square steel boxes set in the concrete wall.

How Three Switches Are Controlled from One Point

THE Thomasville Stone and Lime Co. operation, near York, Pa., is considered remarkable in that it produces 2000 tons of stone and lime per day with 26 men. One of the features which makes possible this accomplishment is a unique quarry trackage system.

Three steam shovels load the stone, and a spur of track leads from the main line to each shovel. Since the main line leads direct to the crushing unit, there are therefore only three switches in the entire system. These switches are controlled from one point by a man whose chief duty is to fasten the cable to the cars at the foot of the incline. Therefore no charge is made on the payroll for switch tenders.

Directly in front of the shanty in the illustration may be seen three railroad ties imbedded in the ground. On each of these ties is mounted a double action lever, and to each lever is attached two wires leading to a switch. By throwing the lever a switch is opened or closed as desired.

The 6-gage wire is galvanized to protect it from the weather. The switches are several hundred feet apart and the distance from them to the control levers varies from 400 to 600 ft. Expansion of the wires is taken up by turnbuckles.

This method of operating switches is economical to the company in that it does away with the services of two or more men and eliminates the usual stopping of loco-

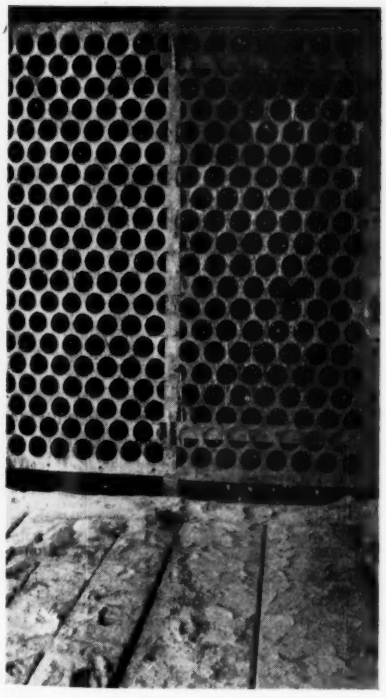
At the plant of the Thomasville Stone and Lime Co. three switches several hundred feet away are operated

motives while the switch is being thrown; this permits the entire operation to function faster and more systematically. Also, the company has found that as a direct result of the installation, its quarry operating costs have been reduced 15 per cent.

Putting Discarded Screens to Work

AT practically any limestone plant may be found a scrap pile the chief contents of which are wornout sections of perforated screens. The accompanying illustration shows how such screens are being used at the Steuben, Pa., plant of the Industrial Limestone Co.

All gears, pinions, wheels and other open moving parts of every machine in this plant are provided with guards to prevent any possible harm to any of the company's employes. In many places, guards manufactured for a particular purpose are installed, but the company has found that wornout sections of perforated screens can be used to an advantage in place of the usual hand railing or fly-wheel guard. In these places the sections were cut to the desired width and straightened and then placed in position as near the machine as best suited. These pieces of screens are so installed that they may readily be removed to oil or repair the enclosed machinery, but in such a way that a man cannot come in contact with the machine by accident.



The section on the right in this illustration is removable, thus affording access for repairs to the enclosed machinery

A Mobile Settling Tank

AT the plant of the Raritan River Sand Co., near New Brunswick, N. J., C. E. Dalrymple, general manager of the company, has installed a cone settling tank that is suspended from a truck which travels on an overhead track.

The illustration shows the construction method employed. The trestle is approximately 200 ft. long and 14 ft. wide, with 40-lb. rails spiked to 10x10-in. timbers running the full length. The truck from which the tank is suspended is similar in design to the standard type overhead traveler for chain hoists. As the track is level the truck is easily moved back and forth by man-power.

The launder from the washing plant is provided with gates at various points along the trestle so that the flow may be directed to the tank at any location. This flume is mounted on one of the 10x10-in. timbers on which the track is laid. Another flume carrying away the overflow from the suspended tank is mounted on the opposite side of the trestle, and it also extends the full length of the structure.

Prior to the installation of the overhead track and settling tank, the entire overflow from the washing plant was sluiced direct to a sump and wasted. The pile of engine sand under the trestle in the illustration is evidence that the company had formerly been wasting a valuable product. The most interesting feature of the arrangement is that it permits the company to take advantage of abundant storage space and with a minimum of handling. This sand is reclaimed by clamshell and loaded either into railroad cars or trucks, as the trestle is constructed in the center of a plot of level ground that parallels the railroad tracks and roadway. This grade of sand is sold chiefly for traction purposes.

This movable settling tank affords use of large storage space

Quarried from Life

By Liman Sandrock

"Health Respectfully"

JUST how would you go about introducing A. P. Sandles to anyone in the industry? Wouldn't you expect to hear the other fellow say right off the bat, "Say, where do you think I've been all this time—out in the sticks?"

Well, that's just it—everybody knows him! At that, we think we can tell you a thing or two that you've either forgotten or never knew. Let's go!

Beginning at the beginning, A. P. Sandles was born in a log house in Putnam county, Ohio, which state is not only a giver of presidents, but has cradled the most secretaried secretary in our midst. To be exact, this happened on February 5, 1871. Naturally, he toted his little bundle of books to the village school and absorbed all it had to offer. Later came normal classes at Otterbein University, and then the training which has helped so many of us to understand our fellow man—school teaching. Many's the good thing which, hammered in at the bottom, in time reaches the top and finds permanent placement, as the experience of any school teacher will prove.

After six years as clerk of courts, A. P. put in three years as clerk of the Ohio Senate, in Governor Pattison's administration. A clerk in a state senate tucks away in the back of his head more useful knowledge than falls to the average man in industrial affairs, else why be a clerk?

"Came a time," as the fiction fellows have it, when our subject was receptive to the secretarial germ, for now we find him Secretary of Agriculture of Ohio, in Governor Harmon's administration and in Governor Cox's. But at that, he was secretary of the Putnam County Fair for 27 years. So you see that he is a natural-born secretary, than whom there is none whomer.

For seven years Mr. Sandles was a member of the Ohio State Board of Agriculture.

Most of us know his association magazine, in which is found the earmarks of the trained editor, and we have asked: Where did he get this editorial experience? Answer—He was ye editor of the Putnam County *Sentinel*, that county's weekly paper, and doubtless had the usual struggles with "Pro Bono Publico," "Veritas," and "Constant Reader" that, coming when one is young and nippy, serve to add character and charm to one's mental equipment. Even today he is the editor of the Rural Welfare page of the Toledo *Weekly Blade*.

If you ask Mr. Secretary what he considers the greatest personal victory he has ever achieved, he will tell you that this happened last year when he led the fight in Ohio against a vicious taxation amendment. It was defeated in 83 of the 88 counties of that state and rejected by 244,000 of its voters.

His present connections as a hard-working secretary are:

The National Crushed Stone Association

Secretary A. P. Sandles

Ohio Macadam Association
National Limestone Agricultural Association
Uniform Tax League of Ohio
Farmer's National Congress

And for good measure, he is also president of the Ohio Fair Circuit, the largest association of county fair men in this well-known world; a member of the Board of Review of the National Trotting Association; Ohio director of the Federal Land Bank of Louisville, Ky., and editing that page in the Toledo *Weekly Blade* to which we have already referred. A busy business man, what?

Mr. Sandles' home is in Ottawa, where he resides with Mrs. Sandles and those of his children who have not forsaken the parental nest for Hymen, for, saith the poet Cowper, "Domestic happiness, thou only bliss of Paradise that has survived the fall!"

Eight children have blessed the Sandles home. Are some of them, at the least, followers in their dad's footsteps, and occupying secretarial positions? That we can't say for sure, but how could they escape? You answer that.

Give 'Em the Question Air

WHO lost the coal strike?

Who discovered priorities?

What's become of the Central States case?

Why are open-top cars called coal cars?

What are the chances for priority orders next year?

Who is the handsomest man in the National Association?

Who is the best golf player?

Who is the worst?—*National Sand and Gravel Bulletin.*

"What Do You Think of Us?"

THIS question is asked of his fellows by Editor Dinsmore of the *Warner-American News*, published in behalf of the Charles Warner Co. and the American Lime and Stone Co.

And further: "Is the *News* worth while? Does it fill a real need? This is *your* magazine, and we want you to feel that you have a place in it. What would you like to see in it? What don't you like?"

This is getting under the skin of the whole undertaking, and doubtless this little circle of readers feel its need, believe in it, and are with the editor for keeps.

The increasing necessity for a magazine of exchange of ideas, interests and human uplift is being manifested constantly in our industries today. And the time is near when more of our companies will adopt this means of letting their employes know how human they are; that they have their interests at heart, and are with them always in all that will make them contented, loyal, and useful members of the business family. It's fine!

They Said It

A LEARNED PROF declares his ability to smell color and feel the voice. Oft' and many are the voices we've felt. If only we could sniff a rich amber or inhale a sparkling ruby—oh, boy!

WHILE READING that Montana was once tropical country, that the crocodile, rhinocerous, elephant, camel, and saber-toothed tiger roamed the state, we were minded to write to Secretary Casey of the Story Rock Co., out to Bozeman, and find out if Dad Volstead had—. And then we discovered that all this was about 5,000,000 years ago, long before Dad's time.

Editorial Comment

Twenty Years of Progress

The Portland Cement Association and ROCK PRODUCTS are both twenty years old. In that period the rock products indutsry has grown from an unrecognized, insignificant factor in the industrial world to a now universally accepted basic industry of equal importance to iron and steel and coal. That accomplishment in that length of time has been made possible almost entirely by a group of far-sighted business men whose one idea has been to *create* business.

The extensive and universal use of cement as a structural material has literally created the commercial sand and gravel industry—an industry today representing investments of not less than $150,000,000 and a business with an approximate yearly turnover of $100,000,000. The use of cement has at least doubled the demand for crushed stone—an industry representing investments of approximately $150,000,000 and another business with a yearly turnover of approximately $100,000,000.

The growth of the cement industry has created a market for nearly a million tons a year of gypsum rock. In the case of lime, it is true that portland cement has made some of its progress at the expense of lime, particularly in the mortar field, but on the other hand the growing use of hydrated lime in concrete has at least compensated lime manufacturers for the loss of the mortar business—nor, for that matter, is the mortar business permanently lost to lime manufacturers.

The growth of the portland cement industry is largely the result of business actually *created*—construction of things from roads to hog troughs—which probably would not have been built at all, except for the promotional activities of the Portland Cement Association. The only real sufferers from the intensely aggressive business tactics of the cement industry have been the cut-stone, brick and lumber industries. These industries have been far outdistanced in the race for supremacy in the building material field; but their falling to the rear has been due, in the last analysis, to changes in economic conditions—high cost of labor, improved construction, etc.—of which cement manufacturers merely took full but fair advantage.

Such changes in economic conditions are always taking place and no industry is secure in its prosperity or prestige unless it is organized to take full advantage of all changes in its favor, and to adapt itself to adverse changes. Competition between individual concerns in a single industry have undoubtedly been modified by strong trade associations; but competition between whole industries has been tremendously increased by the same trade associations, so that the public is a real beneficiary in the end.

One thing the portland cement manufacturers have not done, by the admission of one of their leaders, is the cultivation of the good will of the average thinking man. The power, the prosperity and the publicity they have achieved have perhaps made them too aristocratic for their time and country. In any event they have had disagreeable and probably undeserved experiences with the public that might have been avoided by a more democratic and confidential attitude toward the public.

Trade associations, such as the Portland Cement Association, have fast become more and more quasi-public institutions. They have come to wield enormous influence for good or evil. The public certainly has an interest in the results of their work, and any association in the last analysis will live or die on the reaction of the public toward it; consequently a trade association that desires to live can not neglect public opinion—and while public opinion may be *influenced* by propaganda it is *won* only by confidence and faith and good-will.

Only One Answer

An Eastern sand and gravel producer, who *is* an engineer and who *knows* whereof he writes, states: "One very desirable thing is a greater spirit of co-operation between engineers, contractors and producers. Too frequently they work at cross purposes with the resultant loss of efficiency. In this district during the past season we have had several occasions where the contractor has opened roadside pits and only used the legitimate producer as a convenience. The engineers have allowed the use of material from these pits of a quality inferior to that demanded from legitimate producers. This is really an economic waste in many instances, though there are other cases when local pits are a real economy. Ordinarily the cost or price bid on a mile of road is based on quotations for material from legitimate producers, so that any saving by the use of roadside material is almost invariably an extra profit to the contractor and does not result in saving the public any money, nor in building more roads."

Here is a very clear-cut statement of facts familiar to every producer. How can such handicaps be overcome? There is just one answer—practically 100 per cent organization of the producers. Only in this way can contractors and highway engineers be compelled to recognize their dependence on the commercial sand and gravel industry and take some interest in the problems of its economic operation. But, on the other hand, in dealing with engineers and contractors, producers must be willing to recognize, as this producer recognizes, that there are some instances where the use of roadside material does result in real economy. An economic truth is a stone wall, not blocking progress, but to stand on to achieve more progress and higher aims.

Accident Prevention

An Important Aid to Construction

By R. C. Marshall, Jr.
General Manager, Associated General Contractors of America

ACCIDENT prevention, until some 20 years ago, received its principal impetus through laws instigated by employees or students of sociology and often bitterly opposed by management, but since then the situation has radically changed. We find that management itself is stepping far beyond the statutes to provide safe conditions of employment and to serve the health and lives of workmen. This safety movement, which has been co-ordinated and extended by the National Safety Council, through the support of some hundreds of industries embracing more than 4,000 companies, is now reducing the frequency of accidents in many lines of production, and is lowering production costs. Its benefits to both employes and management have been proved by actual performance. The success and momentum which the work has gained is unquestionably attributable to three good and practical features of accident prevention. These features, which have been repeatedly emphasized by writers and speakers interested in safety work, are:

1. Mitigation of suffering and hardship to disabled workmen and their families.
2. Reduction of production costs.
3. The improvement of industrial relations.

The first, a humanitarian benefit, requires but a moment's reflection to stir an appreciation of its need and justify the effort to secure it in construction. Constructors are desirous of reducing the physical suffering and poverty caused by accidents in an industry, and any slowness in getting actively behind the move should not be attributed to indifference.

If safety work is lagging unduly in the construction field, it is due in great part to the fact that contracting is still, to a great extent, a one-man business without specialized departments and that the life of the individual heads of small and medium-sized companies is a strenuous existence. Their energies have of necessity to be concentrated on the most tangible and pressing problems. The desire to alleviate the suffering is with them as with other humans, but progress will doubtless be slow until the conception of safety work as a concrete and tangible factor is better understood. Having acquired an understanding of the methods of tabulation, study, classification and application of safety measures, constructors both large and small can be counted on to more actively attack the problem.

The humanitarian aspect of accident prevention alone warrants the efforts already devoted to safety work, but it is also supported and justified from the financial standpoint by saving through safety or, in other words, the lowering of production costs. Actual experience has demonstrated that accident prevention cannot properly be viewed as an added expense, because, like the cost accounting system, it not only justifies the expenditure but also more than pays its way.

Hold Marginal Buyer

At the present time and for some years to come, the lowering of construction costs is a problem to which construcion companies must bend increasing energy. The inverse ratio of construction volume to construction cost is a simple economic axiom, and contractors realize that to maintain the volume they must resist the rising tendency of costs. The poor economic reasoning of simply passing the expense along has been shown up by the manner in which such procedure quickly checks demand, and the wiser course of keeping costs at a minimum now seems to be universally accepted.

The problem, therefore, has become one of estimating at a profit without driving out the marginal buyer of new construction, and it means eliminating every unnecessary expense. In doing this the saving by safety work can assist in a number of ways, which may be outlined briefly as follows:

The reduction of accidents by an individual company enables it to obtain from the insurance companies a special rating on experience. This rating means that the company obtaining it pays a premium on its liability insurance that is lower than the standard rate. A representative of one insurance company cited a case at the last annual meeting where one constructor obtained a reduction of 30 per cent.

The accomplishments of the Fred Ley Co., which reduced its accident frequency some 85 per cent in three years, is an instance well known to those who have followed accident prevention in construction.

Another instance cited at the convention last year was that of a Massachusetts manufacturer who was saving over $100,000 a year on insurance premiums. In construction, where the average premium may run as high as 8 per cent of the total labor costs and as much as 20 per cent in specific trades, these economies are assuredly worth an effort.

(To be continued)

Making Transportation Better

The following extracts from the forthcoming annual report of the Secretary of Commerce for the fiscal year 1921-22 show some reasons why transportation has broken down and suggests some remedies

OUR transportation facilities have lagged far behind the necessities of the country. Progress has been made in their restoration from the demoralization of war, but our rolling stock, our trackage, and many of our terminals are unequal to our needs. Some increases in equipment have been made during the past year; yet they are entirely insufficient as the result of long-continued financial starvation. The deficiency in transportation finds its visible expression in car shortage; and while the recent strike has temporarily aggravated the situation, the trouble is far more deep-seated. Except during periods of business depression or strikes there has to some degree been continuous car shortage for the last six years. Furthermore, car shortage reaches its most acute stage during the four or five months of peak load in the fall and early winter.

Railway cars are the red blood corpuscles of commerce, and we suffer from commercial anemia every year because they are starved. The losses through short transportation are a tax upon the community greater than the cost of our government, because such a shortage not only stifles the progress of production and introduces speculation into distribution, but it also seriously affects price levels. No better instance exists than the lift in the price of coal by over 300 per cent in 1920 when there was no strike, and over 60 per cent in 1922, after production following the strike had been resumed. In both cases the mines could have produced 30 per cent more coal, and if the railways could have transported even 20 per cent more, then prices would have been normal. Furthermore, this very shortage is one of the most deep-seated causes of the instability in the bituminous industry and its recurrent strikes. The car shortage also directly affects our farmers.

Management Is Efficient

The management of our principal railways today, by all the tests of administration, of load factors and of mechanical efficiency, is the most efficient transportation machine in the world insofar as it is not limited by causes beyond the managers' control.

The situation has been contributed to by the war, but also fundamentally by the cumulation of experiments in public relations to the railways, both national and state. We have tried uncontrolled operation; we have tried negative regulation in the prevention of discrimination; we have nationalization; we are now trying positive regulation. Nationalization would be a social and economic disaster; free operation would reconstruct the vicious practices of 30 years ago. Regulation in some form is necessary, but constructive development of this regulation—to preserve the initiative and responsibility of our railway executives, to secure the fine values of private operation, and at the same time to secure public protection and assure adequate service—is absolutely vital and not necessarily incompatible. The present Transportation Act possesses many constructive features and some weakness. It was the result of compromises in many particulars, and these very compromises are some of its weakest points.

If the causes of financial starvation were solely a question of war and of hard times, we could afford to wait for a natural solution, but they are not. The Transportation Act of 1920 affirmatively declared that the rates should yield a fair return on the aggregate real value of the railway properties (as determined by the Interstate Commerce Commission) used in public service and operated under honest, efficient, and economical management. It provided that the fair return during the first two years should be at the rate of 5½ per cent on the railways as a whole, or in each of the major groups in which the country might be divided in the administration of the law, and that during this period there might be added 1½ per cent for rehabilitation. At the expiration of this two-year period the Interstate Commerce Commission placed the fair return at the rate of 5¾ per cent per annum, or 6 per cent less ¼ per cent to cover income taxation. The law however, further provided that any particular carrier which earns in excess of 6 per cent per annum shall hand over one-half of that excess into a contingent fund to be administered by the Interstate Commerce Commission "in furtherance of the public interest in railway transportation" either by loans to carriers or by the purchase of transportation equipment and facilities and the leasing of the same to the carriers. The carriers have never earned these amounts and the failure of earnings without charge on the government is complete disproof of the current fiction that earnings are "guaranteed."

Voluntary Consolidations of Weak and Strong Roads

Furthermore, the immediate effect of this recapture provision would be that whereas the strong and fortunately situated railways are able to earn in excess of 6 per cent, and are therefore able to secure finance for betterments, the very fact that they did earn in excess of the average would mean that the weaker roads were unable to earn up to the average.

The present act contemplated the solution of the problem of the weak roads through voluntary consolidation of the weaker and stronger roads into larger systems to be definitely indicated by the Interstate Commerce Commission. There is no doubt that such consolidation would be a large advance in solution to the whole problem. As the nation has resolved to control rates, and thus to depend no longer on competition as a means of rate regulation, it should secure the manifest advantages of larger systems. The economies in operation through standardization and better employment of rolling stock would be constructive themselves, but of vastly more importance would be the strengthening of the foundations for the financing of betterments and for more intelligent handling of rate regulation. The part of the act providing for consolidations has not been advanced very much so far, although a tentative plan of grouping has been issued to serve as a basis for investigation, and hearings have been begun. When the permissible consolidations are once enunciated it is possible that some railways can

Sand and Gravel Convention

THE seventh annual meeting of the National Association of Sand and Gravel Producers will be held January 24, 25 and 26. Washington, D. C., has been tentatively selected as the place of meeting. Details of the program have not been completed, but members are assured of three big days in the capital city with many unusual treats. Begin making your arrangements now to attend this convention.

arrange terms amongst themselves for such consolidations.

How far such voluntary action would solve the problem is uncertain, but compulsory consolidation leads into many untenable premises. It might be that there could be invented some inducements to consolidate into the proposed systems, or to lease for consolidated operation, or some form of co-operative operation. If the recapture profits principle is to be maintained and if it can be enforced by the Interstate Commerce Commission, the assured application of such recaptured profits within such enunciated groups in some form might at least be worth discussion as an inducement to consolidate.

The alternative of repealing the miscalled guaranty clauses of the act does not fundamentally assist the expansion of the weaker roads, for so long as rates are controlled by 49 different commissions, it is unlikely that the rates would or could be made discriminatory in favor of the weaker roads, and thus the basis for the financing of betterments by these roads would not be materially improved. The suggestion that all rate control should be repealed except control against discrimination or preference would not meet the situation of the weaker roads, because the restoration of competitive rates would enable the stronger roads to again drive the weaker roads nearer to the wall.

Make High-Class Commodities Pay Proportional Freight Rates

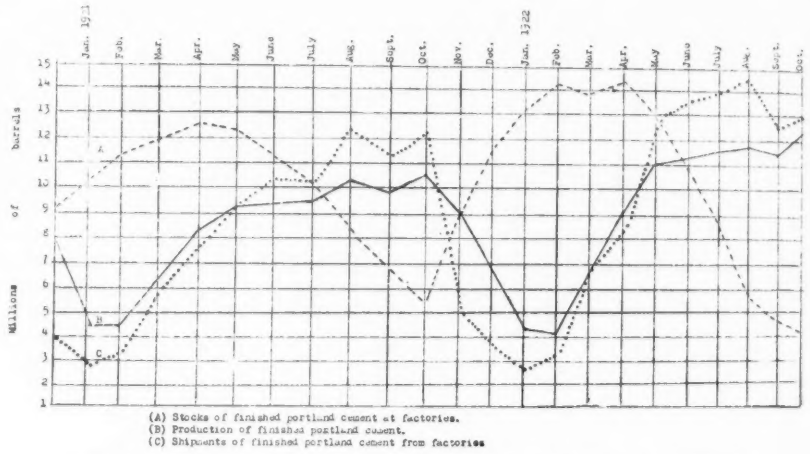
Another vivid question in this connection is that of the rates themselves. In an era of wide disparity between farmers' income and that in and of industry, the transportation rates have proven to be a heavy burden on agriculture. On the other hand, under present conditions railway earnings are obviously not large enough to assure railway expansion. Some relief both to the railways and the farmer may be obtained by thorough reorganization of the rate structure. Some classes and areas of traffic are carried at actual loss; others are carried at lower rates than the relative value of the commodities warrant; and a series of scientific upward readjustments should be made in some cases in order to give the railways and the shippers of primary commodities and agricultural produce some relief. The recent reduction of 10 per cent in rates on luxuries as well as on primary goods contribute nothing to commerce and impoverished the railways just that much. The tangled skein of rates seems a mesh in which there is so persistent a resistance against every constructive proposal, that we are incapable of rescue except by some complete departure in courage.

There can be no question that action in some direction is imperative, if industry and commerce are not to be further strangled by a shortage in transportation. Whatever may have been the sins of railway finance in the last generation, we are not only suffering from them, but we have maintained an attitude of bitterness in our public relationship to our railways for which we pay thrice over in prevention of their proper development.

We must have increased transportation, if we are to maintain our growing productivity. We must therefore find a way out of the cycle of systematic starvation of a large part of our mileage and the denudation of our railway managers of their responsibilities and initiative.

October's Cement Output

The statistics shown in the following table, prepared under the direction of G. F. Loughlin, of the United States Geological Survey, are based mainly on reports of producers of portland cement but in part on estimates. The use of estimates was made necessary by the lack of returns from three producers:



(A) Stocks of finished portland cement at factories.
(B) Production of finished portland cement.
(C) Shipments of finished portland cement from factories

Monthly fluctuations in production, shipments and stocks of finished portland cement

Stocks of clinker or unground cement at the mills at the end of October amounted to about 1,921,000 bbl. compared with 2,336,000 bbl. (revised) at the beginning of the month.

The exports of hydraulic cement in September were 78,615 bbl., valued at $219,898; of this total 77,818 bbl., valued at $214,812, was portland cement, which was sent to Cuba, 30,252 bbl.; to the other West Indies, 4478 bbl.; to South America, 28,440 bbl.; to Mexico, 7514 bbl.; Central America, 5539 bbl.; Canada, 515 bbl.; and to other countries, 1080 bbl. The total exports of hydraulic cement in 1921 were 1,181,014 bbl., valued at $4,276,986.

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT IN OCTOBER, 1922, AND PRECEDING MONTHS

Month—	Production (bbl.) 1921	Production (bbl.) 1922	Shipments (bbl.) 1921	Shipments (bbl.) 1922	Stocks at end of month (bbl.) 1921	Stocks at end of month (bbl.) 1922
January	4,098,000	*4,291,000	2,539,000	*2,931,000	10,300,000	*13,316,000
February	4,379,000	4,278,000	3,331,000	3,285,000	11,400,000	*14,142,000
March	6,763,000	6,685,000	6,221,000	7,002,000	12,000,000	*13,848,000
First quarter	15,240,000	15,254,000	12,091,000	13,218,000	.....	.....
April	8,651,000	9,243,000	7,919,000	8,592,000	12,600,000	*14,470,000
May	9,281,000	11,176,000	9,488,000	12,749,000	12,450,000	*12,893,000
June	9,296,000	11,245,000	10,577,000	13,470,000	11,150,000	*10,718,000
Second quarter	27,228,000	31,664,000	27,984,000	34,811,000	.....	.....
July	9,568,000	11,557,000	10,301,000	13,850,000	10,414,000	*8,433,000
August	10,244,000	11,664,000	12,340,000	14,361,000	8,280,000	*5,746,000
September	10,027,000	11,424,000	11,329,000	12,444,000	6,953,000	*4,724,000
Third quarter	29,839,000	34,645,000	33,970,000	40,655,000	.....	.....
October	10,506,000	12,287,000	12,114,000	12,854,000	5,348,000	4,157,000
November	8,921,000	.....	5,195,000	.....	9,091,000	.....
December	6,559,000	.....	3,697,000	.....	11,938,000	.....
Fourth quarter	25,986,000	.....	21,006,000	.....	.....	.....
	98,293,000	.....	95,051,000	.....	.....	.....

*Revised.

Recent I. C. C. Decisions

A FINDING that rates on lime from Dolomite, Utah, to Los Angeles and certain other points in California on the lines of the Southern Pacific and the Santa Fe were unreasonable but not unduly prejudicial, and that reasonable rates be prescribed for the future, has been recommended by Examiner F. C. Hillyer in a tentative report on No. 13304, The Utah Lime and Stone Co. vs. Santa Fe et al., states *Traffic World*.

The examiner said the commission should find that the rates in issue from Dolomite were not unduly prejudicial, but were and for the future would be unreasonable to the extent that they exceed or may exceed 27 cents per 100 lb., minimum 60,000 lb., to Los Angeles; 35 cents per 100 lb., minimum 50,000 lb., to all points in California south of Stockton on the lines of the Southern Pacific and Santa Fe to and including Bakersfield, and 41 cents per 100 lb., minimum 50,000 lb., to Mojave and points on the coast division of the Southern Pacific, such as Salinas, Santa Barbara, Ventura and intermediate points. He said the reasonable rates for the future were subject to the reductions authorized in Reduced Rates, 1922, 68 I. C. C. 676.

Examiner P. E. Gault has recommended the dismissal of No. 13821, A. E. Staley Mfg. Co. vs. Director-General, on a holding that the rate on sand from East St. Louis to Decatur, Ill., during federal control, was not unreasonable.

The commission has dismissed No. 12781, Wilckes, Martin & Wilckes Co. vs. Director-General, Baltimore and Ohio et al., opinion No. 7981, 74 I. C. C. 13-16, holding fourth-class rates on phosphate of lime in carloads, from Camden and Cooper's Point, N. J., to Chicago, St. Louis and Kansas City not unreasonable, unjustly discriminatory or unduly prejudicial.

More Active Work in the Lime Association

THE National Lime Association has materially increased its activities in the direction of research and educational work.

A division headquarters office has been established at Chicago to cover the central part of the United States and another division headquarters office has been established in Washington—this is in addition to the National headquarters located in the same city—and will have jurisdiction over the eastern part of the United States.

A division manager, G. B. Arthur, has become connected with the association at its central division headquarters at 79 West Monroe street, in Chicago; and Henry M. Camp has been selected division manager for the Eastern division headquarters at Washington.

The association has taken on about 20 additional engineers and chemists who will travel throughout these two divisions disseminating knowledge on the properties and uses of lime and helping to work out the problems of the consumers.

The laboratories of the association have

G. B. Arthur, Central manager

been greatly enlarged and the fellowship work in different universities of the country has been increased to a great extent.

In fact, the association has begun a very active campaign in investigating the properties and best methods of using lime and lime products and in disseminating this information to the consumers to whom it might be useful.

Crushed-Stone Convention

NO live quarry owner or operator can afford to miss the annual convention of the National Crushed Stone Association, La Salle Hotel, Chicago, January 15, 16 and 17. Better make your hotel reservations now. This is going to be a busy week in Chicago—Good Roads Congress and Machinery Show and everything. Be sure to tell the La Salle Hotel manager you are coming to the crushed-stone convention, because convention guests will receive preference.

September Slate Sales Steady

SEPTEMBER slate sales keep up the pace set by August, running over $750,000, and are 2 per cent above 1920 and 4 per cent above 1921, according to 61 producing companies reporting to the National Slate Association. Thirty of the concerns reporting show that September is the first month when the cumulative year's total of shipments in 1922 is 20 per cent above 1921 and 10 per cent above 1920.

Blackboard slate shipped in the first nine months of 1922 is only 10 per cent behind the entire year's total of 1921, the largest blackboard slate year. As two of the largest producing blackboard quarries resumed operations in October after a five months' strike, there is no question but that 1922 will exceed 1921 by 15 to 25 per cent. The increasing use of blackboard slate by industrial plants, railroad stations, newspaper offices, and other commercial places, in addition to the enormous educational building program now under construction, is responsible for this increased demand.

There was 20 per cent more roofing slate shipped during September, 1922, than produced, but the stocks on hand would maintain that rate of consumption for several months. The added production of the two large quarries previously mentioned will soon bring production up to the demand in most sizes, grades, and colors.

As expected, electrical slate September shipments were 25 per cent higher than August and are constantly increasing. Many large projects and buildings have reached the stage where electrical switchboards, panel boards, switch bases, etc., must be supplied.

Slate prices are holding firm. While fuel and car shortage embargoes materially delayed shipments during September and October, the acute situation is now somewhat relieved. Although considerable trouble in getting cars sufficient for shipments is still the rule, contractors and other slate users, appreciating the situation, are anticipating their slate needs and allowing more time between placement of their orders and the time slate is required.

How to Deal with Cement Price

HOW to deal with the cement price situation will be one of the subjects Governor McCray of Indiana will lay before the national conference of states' governors when they assemble in the next annual meeting. He is interested in this situation because of the $1,000,000 and more a year which the Indiana highway department alone spends for cement.

Governor McCray said he did not see how one state could accomplish much so he will urge co-operation among the governors. He declared the problem seemed to him to be one for federal action.

Questions and Answers

7. **Moving Empty Cars.**—Would you mind advising us the most practical manner that you know of for moving empty cars? We have electrical power. While our track has considerable fall, our location has made it necessary to put considerable curve in the track. We are anxious to install something that has proven satisfactory instead of experimenting.—W. E. R., Oklahoma.

A.—Under ordinary circumstances the device known as a car-puller is the most practicable for hauling cars as you have indicated. This consists essentially of a winch, operated by electricity, steam, or air, with a cable of sufficient length to reach from the winch to the farthest car to be pulled. Usually the tracks are so arranged that the puller brings the cars up a straight track to the loading point, and from there the loaded cars run back to the holding track by gravity. With a curve in the track as at your plant, the solution is not quite so simple, but it is nevertheless possible. A home-made puller in operation in Iowa is described on page 36 of the September 23 issue of Rock Products. Your best way of getting the most satisfactory method for moving empty cars at your particular plant, probably, is to put your problem up to a competent engineer or write to some of the reputable manufacturers of the equipment we have described, giving them a plan of your track layout and any special information that may help them in designing a car-puller installation at your plant. If you wish the names of some of these manufacturers, or of engineers, we shall be glad to give them to you by letter.—D. S. C.

8. **Sand and Gravel for Filters.**—Please tell me what requirements sand and gravel must meet in order to be used for filter purposes.—J. S. W., Georgia.

A.—Quite complete specifications may be found in Bulletin 37, Geological Survey of Georgia, by L. P. Teas, Atlanta, Ga. We quote briefly from this report specifications for the filtration plant at Washington, D. C.:

"Filter Gravel—On the floor of the filters and surrounding the underdrains shall be placed gravel or broken stone having a maximum depth of 1 ft. The material for all of the layers may be broken trap rock or granite screened to the proper sizes, or gravel screened from sand and gravel banks of a sandy nature. Gravel screened from hardpan or clayey material cannot be sufficiently cleaned. The gravel shall not contain more than a very small amount of shale or limestone. The gravel shall be washed entirely free from fine material, so that water passing through it or agitated in contact with it will remain substantially clean.

"Filter Sand—The filter sand shall be clean river, beach or bank sand, with either sharp or rounded grains. It shall be entirely free from clay, dust or organic impurities and shall, if necessary, be washed to remove such materials from it. The grains shall, all of them, be of hard materials which will not disintegrate and shall be of the following diameters: not more than ½ of 1 per cent by weight shall be less than 0.13 millimeter; not more than 8 per cent less than 0.26 millimeter. At least 7 per cent by weight shall be less than 0.34 millimeter, at least 70 per cent less than 0.83 and at least 90 per cent less than 2.1 millimeters. No particle shall be more than 5 millimeters. The sand shall not contain more than 2 per cent by weight of lime and magnesia taken together and caluculated as carbonate.—N. C. R.

WHAT QUESTIONS TROUBLE YOU?

Is oil fuel practicable? How much water is needed for washing? What kind of sand is needed for sand blasting? When can stone dust be washed? These are some of the questions answered in this department in the last issue. When you have any questions of general interest on quarrying, crushing, screening, washing, burning, transportation, or other operating or marketing methods in the production of lime, cement, crushed stone, gravel, sand, gypsum, and other rock products, address them to the editor and they will be answered by specialists in the various branches indicated.

9. **Drying and Screening Stone or Washing It?**—If the plan which we propose is practicable, we are going to install a rotary dryer between our primary crusher and the first scalping screen, so that we shall be able to produce a nice clean product of crushed stone, just as well in wet weather as we are now able to do in dry weather.

The top 14 ft. of rock in our quarry has horizontal clay seams and to remove all of this without saving the rock, or moving it entirely as an overburden would be very expensive.

When the weather is dry, as it is usually in this part of the country from mid-summer until after the first of the year, we have no trouble removing the clay at the first scalping screen, but in the spring, when we have lots of rain, the clay gives us a great deal of trouble by following to the bins with the finished material.

We have found that when the clay is dry, by the use of a long revolving screen the rock will, while passing through the revolving screen, beat the clay to a pulp, and that the clay may be screened out at the first scalping screen and wasted, leaving a perfectly clean stone to go to the secondary crushers and the sizing screens over the bins. But in wet weather, we have our troubles, as the clay besmears the finished product in spite of all we can do when loading with the steam shovels, as is most economical for us.

It is our object to be able to produce clean crushed stone in wet weather just as well as we can in dry weather, when the material is thoroughly dry before it goes to the mill, and it occurred to the writer that the rotary drier, properly designed for our purpose would solve our problem.

In the opinion of the writer, the ordinary run of rotary driers will not do, as it would not be wise to reduce the size of the material at the primary any more than had to be as this would entail unnecessary waste and loss of good stone.

It would seem that the rotary drier should be long and not of large diameter, nor should it have shelves, as the desired process would most likely be attained by the action of the stone being rolled over and over onto the clay (similar to a ball mill) while it is being dried out, would tend to pulverize it and same could then be easily screened out at the first scalping screen.

Great care must be taken not to burn the limestone, or even calcine the outer edge of each particle of stone to any appreciable extent, that it would not be marketable as a first class crushed stone and it is therefore not practicable to use a very intense heat.

The whole process would be to bring the material as usual from the steam shovel in 6-cu. yd. dump cars and dump it into the primary crusher, where all material would be broken down to 6-in. cubes and less; from the primary crusher the material would go to the rotary drier and from there to the first scalping screen, where all small material (screenings, etc.) would be wasted and the rejections go to the secondary crushers for further reduction.—W. W. H., Texas.

(Note.—The question above shows much careful thought on the subject which the writer has brought up, and is published in full that readers may enter into a discussion of the subject. Any opinions or any experiences along this line should be addressed to the editor of Rock Products. Below is one brief answer to the question. Others will be published as they reach the editors.)

A.—We would highly recommend a drier but would prefer to recommend scrubbers and a succeeding series of washing screens which will serve the double purpose of making a perfect screening of the materials, and at the same time eliminate all clay seams which may adhere to the stone. The method they suggest seems to be the farthest way around and the most expensive both as to first cost and in subsequent operation.—W. C.

Portland Cement Association Celebrates 20th Birthday

Premier rock products industry has had remarkable growth from annual production of 20,000,000 bbl. to 110,000,000 bbl., largely because it has concentrated on the sale of a single idea, "Concrete for Permanence"

TWENTY years ago some twenty-odd portland cement manufacturers signed a round-robin pledge to attend a meeting to discuss methods of handling cement sacks —a problem which then bothered them. Out of that meeting grew the Eastern Portland Cement Manufacturers' Association, which the following year combined with a group of West and Central West cement manufacturers to form the Association of American Portland Cement Manufacturers—now the Portland Cement Association.

The same year that saw the birth of the two Associations of American Portland Cement Manufacturers also saw the birth of ROCK PRODUCTS — established in Louisville, Ky., by E. H. Defebaugh, with an objective that has always been consistently maintained — "The mission of ROCK PRODUCTS is to serve the trade in any and every honorable way possible, to promote better profits and make life more pleasant for those engaged in the business to which it caters."

To this end ROCK PRODUCTS has continuously preached association and organization, and its publishers and editors have been active participants in practically every such national organization in the industry — and ROCK PRODUCTS' services in the early days to the Cement Manufacturers' Association were no exception.

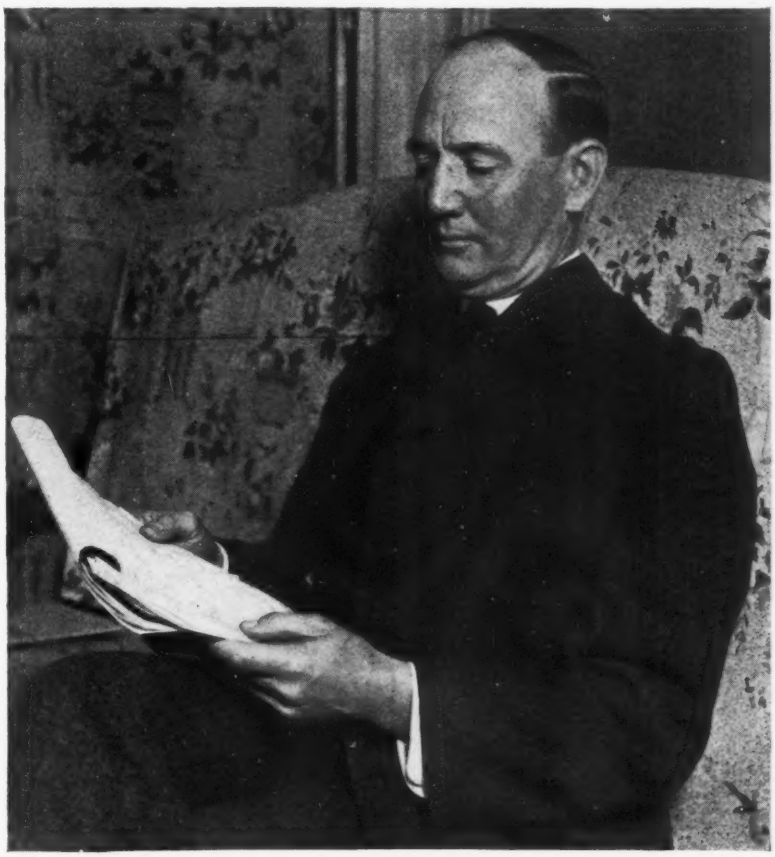
It is fitting, therefore, that in this issue, following the celebration of the twentieth anniversary of the Portland Cement Association, ROCK PRODUCTS should review the history of the industry and of the association at some length, for its history is and has been an inspiration and a guide to all other trade associations in the rock products industry.

Founders Had Vision

The association was fortunate from the start in being able to interest manufacturers of over 90 per cent of all the portland cement produced in this country. It has always maintained a membership representing 90 per cent or more of the whole production of the United States. Therefore the burden of promotional work has been more fairly distributed than in almost any other industry. This matter of membership is interesting, too, because even today the association represents only 90-odd per cent of the production, never having been able to get in *every* producer. So even in the cement industry with all its prestige there are some who are willing to share results without sharing the burdens; which should encourage the members of other associations to bear their burdens more cheerfully.

The matter of bags did not long interest the association. A report of the second annual meeting in ROCK PRODUCTS, April, 1903, states: "The meeting was given over largely to a mingling socially of the manufacturers so as to bring about a better acquaintance and propagate a friendly feeling generally, and very little business was discussed aside from the matter of an exhibit at the St. Louis World's Fair." This factor of real friendship and comradeship among the members—amounting almost to clannishness—has always been one of the marked characteristics of this association, as it must always be of every successful association or other prosperous working organization. The leaders showed wisdom in especially cultivating it from the start.

Nevertheless, in that first year of its existence the association firmly established the industry in the confidence of engineers and the government, by its ready acceptance of its share in solving the problems in the proper use of portland cement and its readiness to begin systematic improvement of the prod-

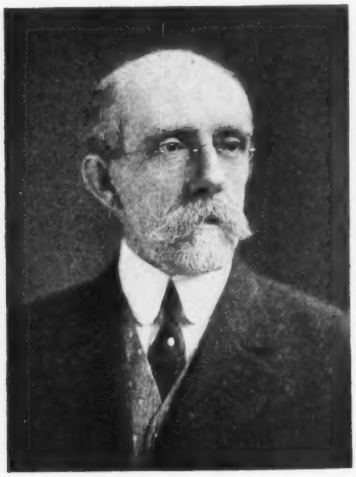


F. W. Kelley, president-elect of the Portland Cement Association
(Mr. Kelley is the president of the Helderberg Portland Cement Co., Albany, N. Y.)

ROBERT W. LESLEY

President 1903

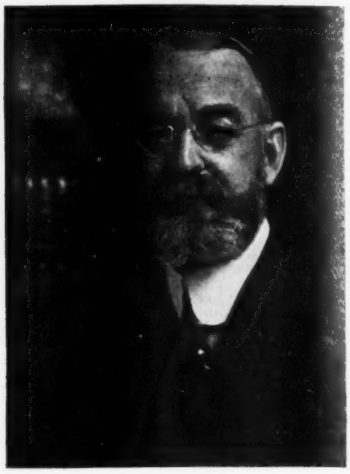
Mr. Lesley was born in Philadelphia in 1853. His early education was received in France. In 1867 he entered the University of Pennsylvania, leaving to become an editor. He finally became assistant editor of the "Public Ledger." He studied law and was admitted to the bar in 1879, although in 1874 he organized the Lesley & Trinkle firm, dealing in cement. In 1880 he, with D. O. Taylor, was a pioneer in establishing this industry. In 1908 the university honored him by graduating him with the degree of A. M., class of '71, this honor making him a full alumnus of the university. In 1914 he was made honorary member of the Portland Cement Association.



JOHN B. LOBER

President 1904-09 and 1913-15

Was born in New Jersey in 1848. Twenty-nine years later became a member of Warren, Lober & Co., manufacturers of coal tar products. From 1883 to 1901 he was vice-president of the Vulcanite Paving Co. In 1894, vice-president and general manager Vulcanite Portland Cement Co. and president in 1903. In 1902 he invited the Eastern cement makers to a meeting resulting in the formation of the Portland Cement Association, and was made vice-president. In 1903-09 he was president Association American Portland Cement Manufacturers; 1911-12 treasurer the present association, and re-elected president in 1912, serving until 1915. He is now president Vulcanite Portland Cement Co.



W. S. MALLORY

President 1910

Mr. Mallory was born in New Haven, Conn., in 1861 and received his early education in the Baltimore public schools. In 1881 he entered the iron and steel business with Carmichael & Emmons, Chicago, and later bought them out, continuing until 1891 as W. S. Mallory & Co. In 1888 he was associated with Edison in the concentration of low-grade iron ore. In 1891 he sold out the Chicago firm and for the next eight years studied iron-ore concentration. With Edison in 1899 he formed the Edison Portland Cement Co. and was made vice-president; in 1908 elected president and continued in management until 1918, when he retired. Mr. Mallory was elected honorary member in 1919.

EDWARD M. HAGAR

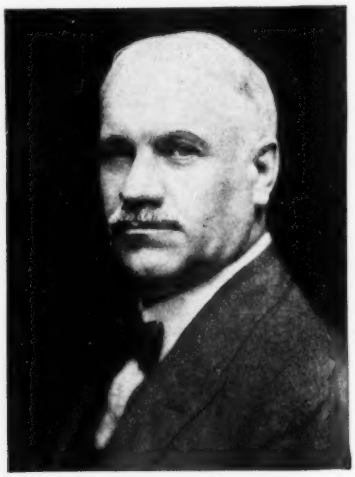
President 1911-12

Mr. Hagar was born in Salem, Mass., in 1873. He graduated from the Massachusetts Institute of Technology in 1893 and completed a post-graduate course at Cornell in 1894. Later he organized the Edward M. Hagar Co., Chicago, representing machinery manufacturers. In 1901 he was made manager of cement department, Illinois Steel Co. On incorporation in 1906 of the cement department as Universal Portland Cement Co., he became president, resigning in 1915. During the next three years he was president of the Wright-Martin Aircraft Corp., and later president of the American International Steel Corp. Mr. Hagar died January 18, 1918.

B. F. AFFLECK

President 1916-20

Mr. Affleck was born in Belleville, Ill., in 1869, and received his education in the public schools. For four years he was with the Harrison Machine works at Belleville and then with the American Express Co., St. Louis, for a year. Following this he was with the Illinois Central Ry. Co. for six years. Beginning as chief clerk for the Illinois Steel Co. in 1896, he became a salesman. In 1903 he was made sales manager of its cement department, and in 1906 this department was incorporated as the Universal Portland Cement Co. Mr. Affleck became president of this company in 1915, and still holds that position.



LESTER T. SUNDERLAND

President 1921-22

Born in 1867. He left school at 14 to enter an Ottumwa, Ia., coal office, and a year later became manager. At 16 he was assistant to the secretary-treasurer of the Whitebreast Coal and Mining Co., Chicago. Two years later he resigned to enter an academy at Owatonna, Minn. Later he went with the Omaha Coal, Coke and Lime Co., which organized a branch in South Omaha known as L. T. Sunderland & Co. In 1896 this company changed its name to Sunderland Brothers Co. In 1909 he was vice-president and manager of the Ash Grove Lime and Portland Cement Co., and later was made president, which position he still holds.

uct. Says Robert W. Lesley, in a booklet recently issued by the association:

"The character of the work of the association was such that before 12 months had passed from its formation it was working in co-operation with scientific bodies of the highest standard such as the American Society for Testing Materials, the American Society of Civil Engineers, the Institute of Architects, iron and steel associations, the Railway Maintenance Association, and even the government of the United States. It was given the rare distinction seldom bestowed upon a business organization, of participating with the leading engineering societies as a member on all committees having to do with specifications for portland cement and concrete. This was due largely to the character and scientific knowledge of the men representing the association in the various technical committees and the high character of the scientific papers read before the association.

"This recognition of the association in its early days by the leading engineering organizations in the United States was well described in an editorial in the *Engineering Record* in 1903, then one of the important engineering publications in the United States, which in commenting on the first year's work of the association stated:

> The association work is something for which the engineering profession has reason to be grateful. The old idea that the manufacturer of materials of construction is the enemy of the engineer falls to the ground in the face of such a record. In its one year of usefulness this manufacturers' organization has done more to advance sound masonry construction than *all other societies together.*" In summing up, the engineer-editor said that the association "had brought producer and manufacturer together, furnished facilities for elaborate investigations and shown itself ready to co-operate in every way to further the real interests of sound masonry construction."

In other words, the Portland Cement Association started to work out the destinies of the cement industry 20 years ago on identical lines with the most approved methods today, and from this experiment of the cement manufacturers, architects and engineers have welcomed similar co-operation from other building-material producers right down to the present time when the engineer-secretary of commerce, Herbert Hoover, is encouraging trade associations in just such activities.

Steady, Unflinching Promotion of an Idea

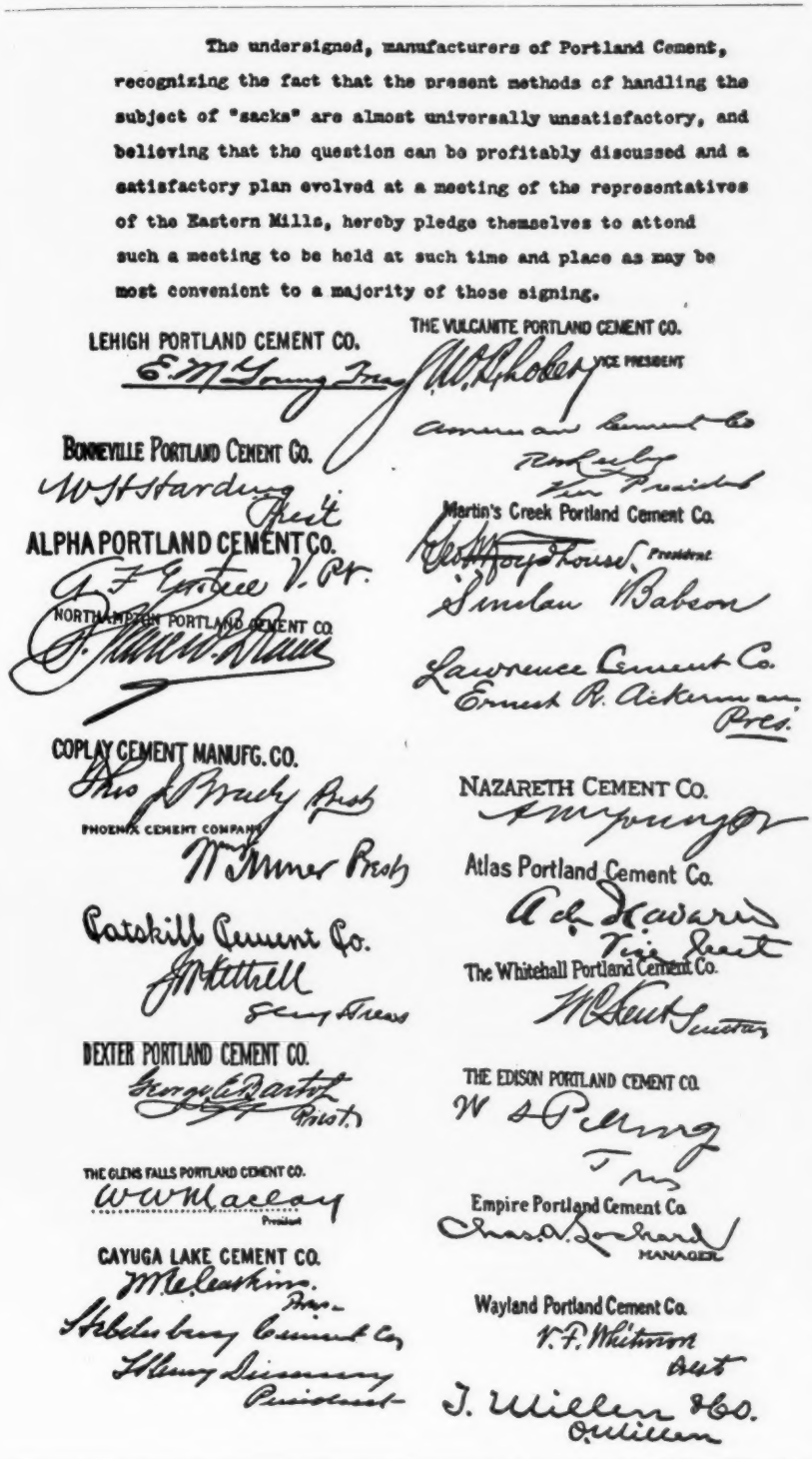
William M. Kinney, secretary and general manager of the association, has admirably summed up the secret of the success of this organization in one pithy sentence: "It has nothing to sell, nothing to advance but an idea, and this idea, *'Concrete for Permanence,'* is advanced with consistent persistence on facts established principally by scientific research work."

If producers in other branches of the rock products industries will read that sentence a second time, and a third time, and absorb the full significance of it, they will understand why during all these years cement manufacturers have hung together and prospered, and why they have made their industry one of the most basic industries of this country.

Lester T. Sunderland, president of the association during 1921 and 1922, defines the activities of the organization more fully as follows:

"Broadly defined, the association's activities are co-extensive with, but nevertheless confined within, the following limitations:

1. Its aim is to increase the knowledge, utility,



How the association got its start 20 years ago

Annual banquet of the Portland Cement Association, Blackstone Hotel, November 22, 1922.

and use of portland cement through scientific investigation, public education, and associational promotion.

2. It sells the "use of cement," but not the commodity, hence it is not concerned with prices nor other trading relationships between its members and their patrons. It cares not what brand of cement is used provided it comes from members' mills, the quality of whose product is known beyond reproach.

3. It performs only such functions as cannot as well, if at all, be performed by its members individually.

4. It undertakes only such activities as are for the common good and whose benefits when utilized flow alike to all contributing members.

5. Its conduct is jealously guarded and made to scrupulously conform in all respects to the highest concept of commercial morality and the strictest interpretation of the laws of the land.

"Congruent with these precepts it manifestly cannot engage in any attempt to solve individual manufacturing problems of its members except where their nature is such as to invest them with common interest and their solution would either directly benefit all alike or otherwise protect the whole industry against unfavorable reaction that would likely result from their neglect."

These indeed are words of wisdom for all who control or direct the activities of trade associations. Such definite understanding of procedure far exceed in important the constitution and by-laws of an association.

Mr. Kinney, elsewhere in his summary of progress, says, honestly enough, that the Portland Cement Association has been the envy as well as the admiration of other trade associations. It need be the envy no longer, except that others may lack the persistence of effort shown by the cement manufacturers; for surely the formula for success is so plainly stated that any industry can follow it if the desire is strong enough.

The Staff of the Association

Presidents may preside and directors direct, but the real work of converting regulations and policies into results falls upon the employed staff of a trade association. So the success and influence of the Portland Cement Association is in no small degree the direct result of the number and quality of the staff it employs and the *esprit-de-corps* with which it is maintained.

"For the three years following 1902, one paid employe, who had a small office in Philadelphia and performed those routine duties that fall to a secretary of a group of manufacturers, constituted the whole "staff."

From this beginning the Portland Cement Association staff has grown into one of the largest engineering, educational, scientific-research organizations in the

November 22, 1922—celebrating the 20th birthday of the premier rock products industry

world. At present there are 342 employes, of whom more than 200 are trained engineers."

As General Manager Kinney has said: "Many products and processes of great benefit to humanity have failed to achieve the full recognition in use to which their worth entitled them because accurate knowledge of their value and utility was not intelligently sought, nor intelligently and widely disseminated.

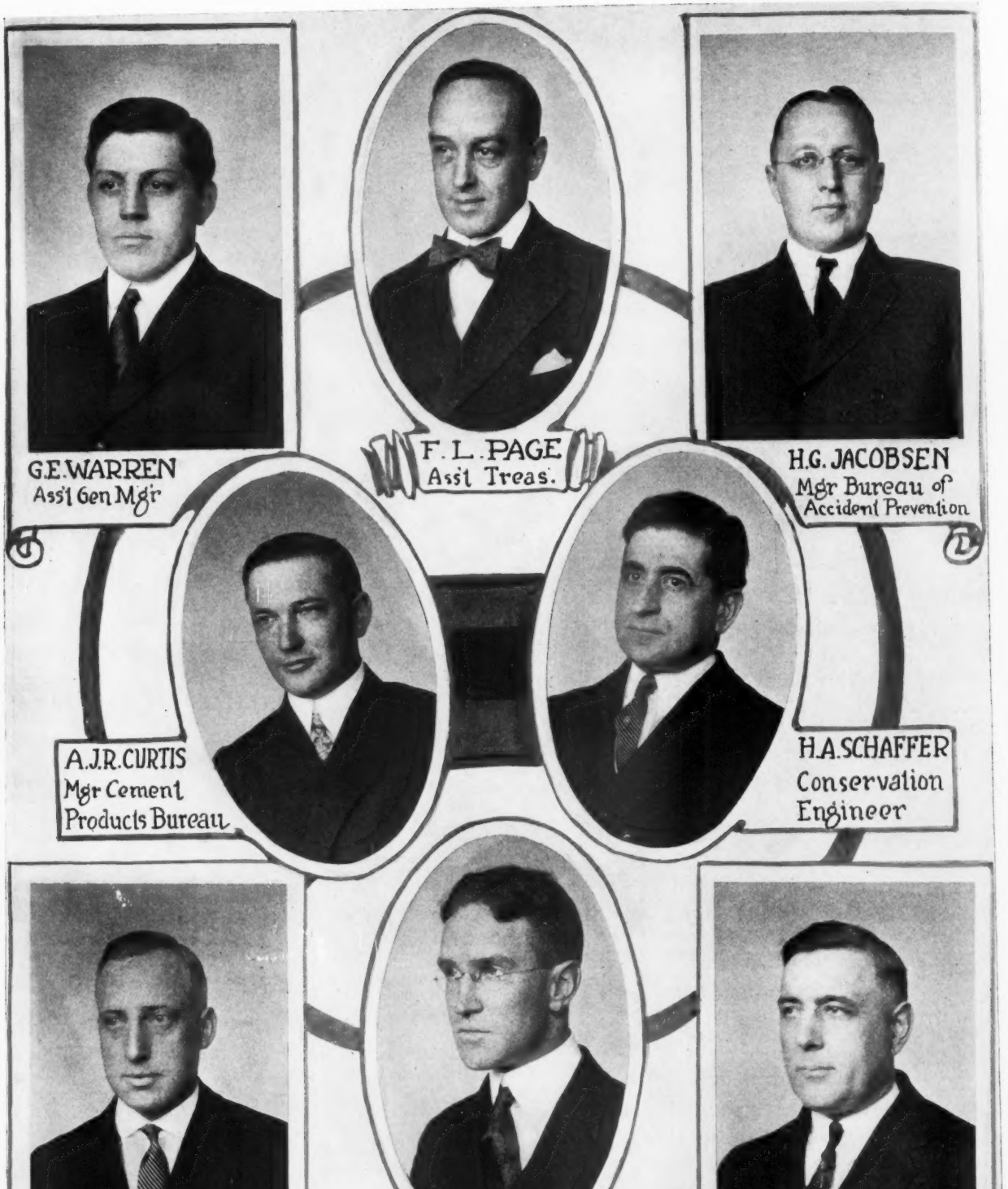
"Were it not for the work this association has been doing for nearly 20 years, the public would still be largely without knowledge of the usefulness and adaptability of concrete, which is now recognized as a prime basic necessity in the forward march and progress of modern civilization."

Work of this character requires large vision and liberality not merely in the matter of salaries and expenditures on behalf of the association, but because the creation of trade opportunities and increased production must ever result in invitnig new producers into the field. In other words, a fair share of the profits of producers already in the field is used to create business from which a new comer may profit equally with the older producers and investors. Fortunately that breadth of vision and liberality of purpose is a characteristic of the typical American business man today, and to it we owe in no small measure the tremendous material progress our country has made. Moreover, it is the acme of business wisdom as the prosperity of the cement industry demonstrates; but such a policy has perhaps never been accepted so unanimously by an entire industry, and that it has been accepted in this case is no insignificant testimonial to the work of the staff of the association in continuously "selling" its members on such a liberal policy.

Necessity of Having Large Staff

The experience of the staff of the Portland Cement Association has proved to its own members, and to all other trade associations as well, that it is not enough to tell that such use *can* be made of a product, or *how* to make such use of it; the association staff must actively co-operate in *demonstrating* such use; and that is why a large staff of high-grade technical men is required.

"Not only does the association direct one of its main endeavors toward research work in cement and concrete, and as a result of such work disseminate its findings, but it takes distinct pride in co-operating with engineers, architects, contractors and others whose worth-while experience and individual research deserve passing on," says Mr. Kinney.



Department heads of the association whose work has made the association so valuable to members

Cement Association Meets in Chicago

OFFICIALS of cement plants in all sections of the United States and Canada attended the sessions of the twentieth annual convention of the Portland Cement Association in Chicago on November 20, 21, and 22. They brought optimistic reports as to improved conditions generally in the industry with bright prospects for the immediate future.

The convention opened on the 20th, the various committees meeting in executive sessions to prepare reports which were submitted at the general sessions. L. T. Sunderland, president of the association, presided, and the program included the reading of papers on subjects pertaining to cement manufacture and mill practice.

A. C. Tagge submitted a report of the special committee on accident prevention and insurance. C. H. Sonntag of the Cape Girardeau Portland Cement Co. read a paper on the waste-heat installation in the plant of that company, and W. P. Gano, chief chemist, Pennsylvania Cement Co., read a paper explaining the different influences on the grinding of portland cement clinker.

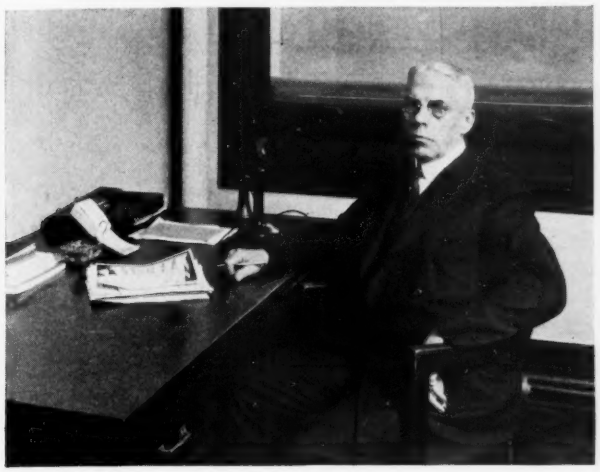
A feature of the convention was the presentation by Secretary of Labor James J. Davis to the association of a concrete bust of Robert Whitman Lesley, the first president of the organization, which was modeled and cast by the boys of Mooseheart.

American Concrete Institute Convention

THE 1923 convention of the American Concrete Institute will be held in Cincinnati, Hotel Sinton, on January 22, 23, 24 and 25.

The present outline of the program provides for sessions devoted to concrete roads; concrete houses and architectural concrete; concrete products manufacture; consideration and discussion of amendments of the Institute by-laws; field practice, and a general discussion of the industry as a whole.

In the institute's *News Letter* of November 22 an earnest appeal is made to every member to bring applicants for membership to the Cincinnati convention.



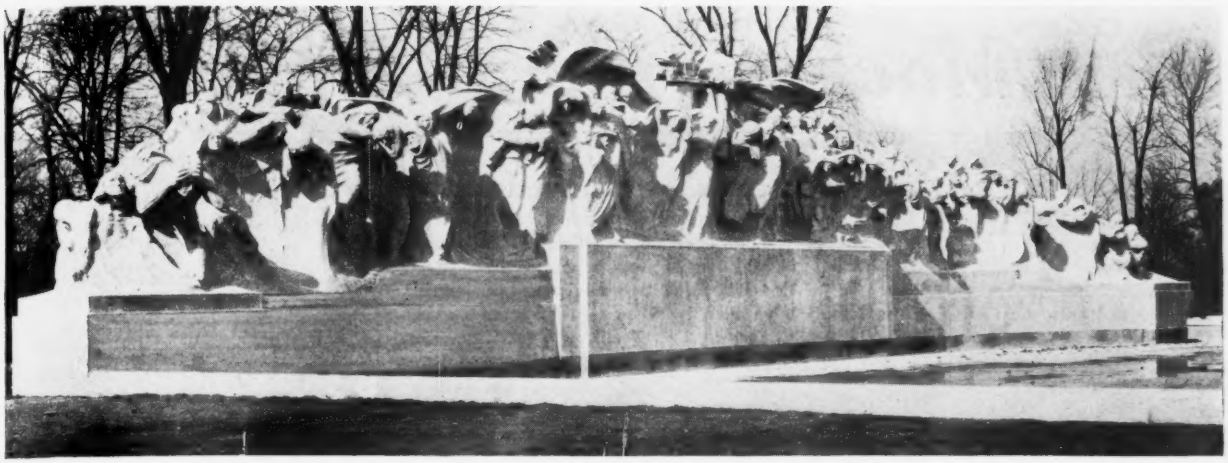
In charge of advertising and publications is H. Colin Campbell

The present secretary and general manager, William M. Kinney

One section of the general offices of the Portland Cement Association at Chicago

In this association library have been collected a valuable set of books, pamphlets, bound volumes of publications, and other works bearing directly or indirectly on the manufacture and use of cement

Besides the secretaries and stenographers of individual executives, about 30 stenographers and typists segregated in this transcribing room are kept busy with association work



"Time goes, you say? Oh no!
Alas, time stays, we go."

A novel use of concrete of great possibilities. Lorado Taft, the sculptor, who was a guest at the Portland Cement Association banquet, said he was perfectly satisfied with the results obtained—color, texture, execution, and everything; said it was better than Tennessee marble and solved a problem he didn't believe could have been solved before the days of concrete. Altogether what Mr. Taft said was as fine a tribute to a material as any artist could have paid any material

A Traffic and Transportation Expert for Rock Products Industries

PRODUCERS and manufacturers of rock products now have available the services of a traffic and transportation expert who has specialized the last few years on the problems of the mineral aggregate industry. This is Edwin Brooker, who was first introduced to ROCK PRODUCTS readers as the traffic manager of the Sand and Gravel Producers' Association of Western Pennsylvania. His articles on the now historic rate cases in the sand and gravel industry will be recalled by all our readers. Since then he has been the traffic manager of the National Association of Sand and Gravel Producers at Washington, D. C.

Recently he resigned his connection with the association and opened offices in the Munsey building, Washington, as a traffic and transportation expert. In this capacity Mr. Brooker is prepared to help any who are having difficulty with their car supply or with the service they are getting from their railroad. If any of them feel that their rates are too high, or find that some competitor has a more favorable basis, or do not have rates to certain markets they want to reach, he can place in their hands the data necessary to bring about a change or handle the negotiations for them with the railroads. Some may have claims which the railroads have declined to pay. They should not file these away, but send them to him and he will review their cases, and if they have any rights in the matter he will tell them so or collect for them. Some may have difficulty in securing action on claims; he can help bring about prompt settlement. These are only a few ways in which he expects to furnish assistance to shippers.

ROCK PRODUCTS is glad to announce that it has retained the services of Mr. Brooker as a special correspondent and consulting traffic expert. As such Mr. Brooker will be glad to answer questions of ROCK PRODUCTS readers that have a general interest or significance to the industry. All such questions and queries should be addressed to the editor of ROCK PRODUCTS. This is another step in rounding out ROCK PRODUCTS' service to readers, which it is hoped readers will fully avail themselves of.

Edwin Brooker

Will Not Halt Building Construction

BUILDING and construction activities in these days of progress and highly developed service will not close like a jackknife with the advent of the cold weather season, and the coming winter will witness the going ahead with a program much more extensive in scope than in previous years, according to L. T. Sunderland of Kansas City, president of the Portland Cement Association, the twentieth anniversary convention of which was in session at the Blackstone hotel, Chicago, on November 20, 21, and 22.

Mr. Sunderland says that in these days of high labor costs it is realized more and more that time is money, and that through the development of modern means of protecting construction work against the elements it is possible to build in all kinds of weather, thus preventing periods of idleness in the various building crafts, and resulting in a great saving of both time and money.

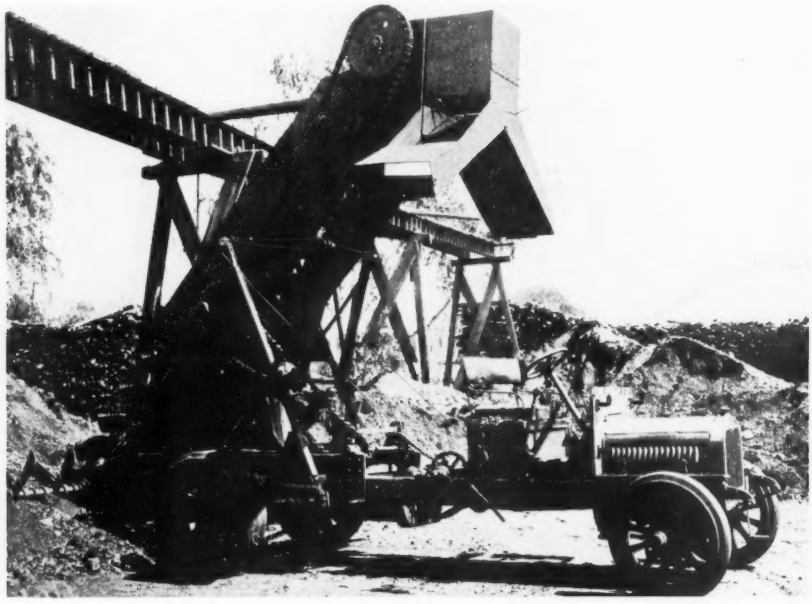
The outlook in the portland cement industry is excellent, provided means are employed for balancing the disproportionate relationships between our several fundamental economic factors. He says the farmers are justly complaining of the high prices they are paying for the things they have to buy, and the relatively low prices they are getting for the things they sell.

Speaking on the subject of road building, Mr. Sunderland said that it is possible there may be some temporary interruption with the various state programs, but that in these days of automobiles, both for industrial and private use, it is realized that a highly essential factor in their use is the well constructed hard surface highways.

New Machinery and Equipment

A New Self-Loading Elevator

SEVERAL truck loader elevators to be mounted on motor trucks have been furnished recently by the George Haiss Mfg. Co., Inc., New York City. Such a piece of equipment is needed, as in many cases high-speed loading of material will be required occasionally at a number of points. The combination gives great mobility and flexibility to the fast and efficient path digging loader element, says the company.



Truck loader elevator used on sand and gravel, earth, etc.

The regular path digger elevator is used with double chain, toothed buckets and feeding propellers, so that no shoveling is required for a path into the pile for the loader. It is pivoted on standard A-frames over the rear wheels, to be collapsed while traveling. A two-way side discharge chute is provided at the top for loading on either side.

The elevator is driven either from the jackshaft, if the truck is equipped with one for a dump body, or by a separate engine. The latter plan is more expensive, but more efficient, as the truck chassis can be moved while loading.

The capacity is 1 to 2 cu. yd. per minute. This loader recently loaded four tons of egg coal in 3⅔ min., a rate of 1½ cu. yd. per minute.

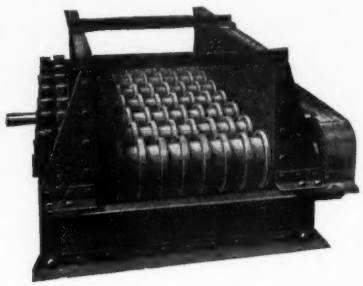
Screen for Crushed Stone

THE demand of the stone-crushing industry for a screen that will economically and accurately separate the coarser sizes of crushed stone is met, it is claimed, by a new type developed by the Robins Conveying Belt Co., New York City. The majority of screens for making the separations from 1½ in. up have had the disadvantages of large space required for installation, high first cost, and high power consumption. These objections are largely overcome, it is said, by the screen described below.

The Robins Cataract grizzly consists of a series of shafts on which are mounted heavy chilled iron discs of such shape that the screening surface composed of these discs contains a large number of openings of the exact size of the desired separation. These shafts are power-driven, the drive being transmitted to the center shaft, each of the other shafts receiving its power from this shaft through chain and sprocket transmissions. The screen is set at about 23 deg. and the shafts are driven at differential speeds—i. e., the shaft at the top of the screen is turning the slowest and the shaft at the bottom is turning the fastest, the speed of each shaft faster than that of the shaft behind it. This fact, together with the angle at which the screen is set, makes it impossible for material to lodge in the screen openings, the upward force applied to the individual lump being greater than the downward force imparted to it by the shaft behind.

These screens present an effective screening area across their entire surface, and therefore handle large tonnages of material satisfactorily. This company has put on the market several models to take care of the requirements commonly met with, the smallest size being a five-shaft machine which will screen from 50 to 150 tons of crushed stone an hour; the largest size, a nine-shaft machine, built to handle up to 1000 tons.

Two of these screens have been in operation for over a year at a big Michigan crushing plant whose output approaches 40,000 tons a day, and have given excellent service. One of the screens making a 6-in. separation has handled 750 tons an hour, and the accuracy of sizing has varied from 95 to 98 per cent. In this instance it is desired to obtain a very clean product for open-hearth work at the steel plants. The other screen makes a 1½-in. separation, the product being blast furnace fluxing stone.



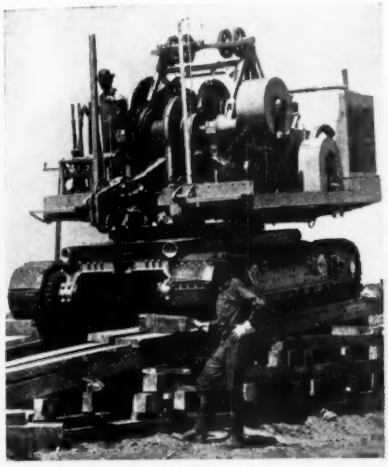
This grizzly consists of a series of shafts on which are mounted heavy chilled iron discs, with openings the exact size of the desired separations

In addition to such accurate work, these screens are used in "scalping" operations. Here the screen is generally placed just before a crusher in the flow sheet and relieves the load on the crusher by taking out all the material already reduced to proper size. Owing to the machine's non-clogging feature, it is unnecessary to have a man watching the operation as in the case of a bar grizzly.

But small space is required for the screen installation. A machine capable of handling a tonnage of from 150 to 200 tons an hour is only about 6 ft. long and 4½ ft. wide. This type of screen is entirely new.

A Crane Excavator With Unusual Features

FLEXIBILITY and simplicity of operation, combined with accessibility of parts insuring maximum speed and therefore economical handling of materials, are the features claimed for the crane excavator manufactured by the Koehring Co., Milwaukee, Wis.



Showing the details of the crane in the illustration below

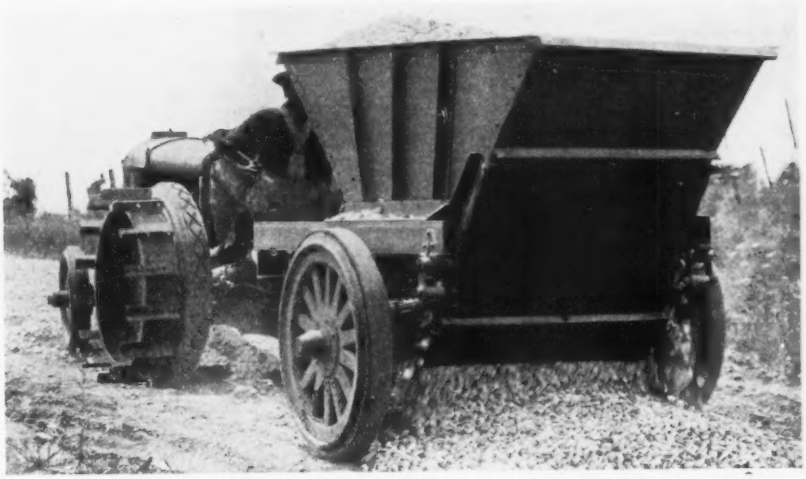
One of the features which makes maximum speed possible is the specially designed spur gear drive in connection with the friction clutch and a double drum which equalizes the stresses in boom members, enabling the loaded bucket to be boomed in and out as often as necessary to reach materials without moving the crane; this can be done faster than any crane could travel and get the material for similar work. All the functions are independent of each other — in other words, it is possible to hoist the cable, raise the boom, swing and travel simultaneously, as there is a lever for every action and no interlocking sets of gearing or clutches.

Two line speeds insure simplicity in changing from clamshell operation to dragline work. When this is done it is necessary only to change buckets and shift a clutch to give a slower speed and greater power. None of the machinery, gearing or drums need be changed in any way.

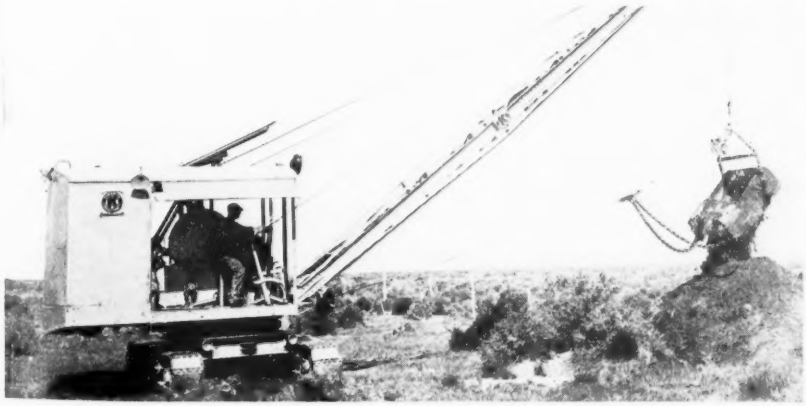
In the same manner, to change to power-shovel work no rebuilding or removal of machinery parts is needed. All that is required is to change the boom and supply the dipper handle and shovel with proper cable and drive parts.

This crane is built in two sizes. No. 2 is equipped with a 35-ft. boom, handles a 1-yd. bucket at a 33-ft. radius and has a lifting capacity of 24,000 lb. at a 12-ft. radius. It is driven by a 70-hp., four-cylinder gasoline engine. Mounted upon full-length Koehring designed multiplanes it has forward and reverse traction with a positive steering arrangement. The crane is able to travel anywhere, has a full circle swing, and is furnished with either a canopy top and drop curtains, a half cab or an enclosed cab. All levers are conveniently banked at the right front side so that the operator has a complete view of all parts of the work. This crane can be equipped for any kind of material handling, excavating or grading and for pile driving or with block and hook. The extreme height of the No. 2 is 12 ft. 6 in. Its greatest width is 9 ft. 10 in., and it will swing in a 10-ft. 3-in. radius.

The No. 3 crane handles a 1½-yd. bucket at a 40-ft. radius and has a capacity of 20 tons at a 12-ft. radius. It is driven by a 100-hp., four-cylinder gasoline engine. The extreme height of the crane is 14 ft. 10 in.; its width is 11 ft., and it will swing in an 11-ft. 8-in. radius. It has a 45-ft. boom. Other salient features of this machine are the all-steel construction and the air starter on the gasoline engine.



All-steel construction trailer, with 2-yd. capacity



This crane has a 35-ft. boom, handles a 1-yd. bucket at 33-ft. radius, with a lifting capacity of 24,000 lb. at a 12-ft. radius

General Meeting Called of the Slate Industry

MANUFACTURERS, producers, distributors, dealers, roofing, and other contractors using slate are planning to gather in New York at the Commodore hotel, on January 25 and 26, for the slate industry meetings to be held under the auspices of the National State Association.

Many of the leading concerns in the industry, will hold their own sales meetings with their representatives immediately before or after the dates of the sessions devoted to the industry problems. Roofing contractors and other users of slate all over the country have responded well to the need for a co-operative promotion of the use of slate and the betterment of the conditions and relations within the industry, which Secretary Hoover urged the progressive concerns of the industry to undertake at the first meetings last year. The results of the first nine months' effort have more than justified Mr. Hoover's judgment.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.25	1.10	1.10	1.10	.....
Buffalo, N. Y.			1.30 per net ton all sizes			
Chaumont, N. Y.	1.00	.....	1.50	1.25	1.25	1.25
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	.....
Coldwater, N. Y.			1.50 per net ton all sizes			
Eastern Penna.	1.35	1.35	1.35	1.35	1.35	1.35
Munns, N. Y.	.75	1.15	1.15	1.15	1.00	1.00
Prospect, N. Y.	.75	1.25	1.25	1.25	1.25	.....
Walford, Pa.	.....	1.30	1.30	1.30	1.30	1.30
Western New York	.75	1.20	1.20	1.20	1.20	1.20
CENTRAL						
Alton, Ill.	1.50	.....	1.50	1.35	.....	.....
Buffalo, Iowa	.90	.....	1.20	1.00	1.05	1.05
Chasco, Ill.	1.30	1.25	1.25	1.25	1.20	.....
Chicago, Ill.	1.30	1.70	1.30	1.30	1.30	.....
Dundas, Ont.	1.00	1.00	1.35	1.25	1.10	1.10
Faribault, Minn.	.....	.....	.....	.....	1.75	.....
Greencastle, Ind.	1.00@1.25	1.10	1.00	.90	.90	.90
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.50
Krause, Columbia and Valmeyer, Ill.	1.20	1.20	1.35	1.20	1.20	1.20
Lannon, Wis.	.65	.....	.95	.85	.85	.....
Mitchell, Ind.	.80	.80	.80	.80	.80	.80
Montreal, Canada	.80	1.35	1.05	.95	.90	.....
Montrose, Ia.	.....	1.50	1.60	1.55	1.45	1.40
River Rouge, Mich.	1.00	1.10	1.10	1.10	1.10	1.00
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Southern Illinois	1.35	1.30	1.25	1.25	1.25	.....
Stolle, Ill. (I. C. R. R.)	1.30	.....	1.35	1.35	1.35	1.35
Stone City, Iowa	.75	.....	1.40	1.30	1.25	.....
Toledo, Ohio	1.60	1.70	1.70	1.70	1.60	1.60
Toronto, Canada	1.90	2.25	2.25	2.25	2.00	2.00
			Prices include 90c freight			
Waukesha, Wis.			All sizes 1.00 per ton			
SOUTHERN:						
Alderson, W. Va.	.75	1.25	1.40	1.25	1.15	.....
Bromide, Okla.	.75	.....	.....	1.50	1.50	.....
Cartersville, Ga.	2.00	2.00	2.00	1.40	1.25	.....
Chickamauga, Tenn.	.85@1.00	.85@1.00	.....	.85@1.00	.85@1.00	.....
Dallas, Texas	1.00	1.00	1.00	1.00	1.00	1.00
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Ft. Springs, W. Va.	.50	1.15	1.40	1.25	1.15	.....
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	.....
Ladds, Ga.	.....	.....	1.40	1.40	1.40	.....
Morris Spur (near Dallas) Tex.	1.00	1.40	1.40	1.40	1.40	1.25
WESTERN:						
Atchison, Kans.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs and Wymore, Neb.	.20	1.65	1.65	1.55	1.45	1.40
Cape Girardeau, Mo.	1.50	.....	1.50	1.50	1.25	.....
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.40

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	.....
Branford, Conn.	.60	1.50	1.25	1.15	.95	.....
Bound Brook, N. J.	1.80	2.30	1.90	1.50	1.40	.....
Dresser Jct., Wis.	1.00	2.25	.....	1.75	2.00	.....
Duluth, Minn.	.90@1.00	2.25	1.90@2.00	1.40@1.50	1.25@1.40	.....
E. Summit, N. J.	2.10	2.30	2.00	1.70	1.40	.....
Eastern Massachusetts	.60	1.85	1.40	1.40	1.40	1.40
Eastern New York	.75	1.50	1.30	1.30	1.40	1.40
Eastern Pennsylvania	1.15	1.50	1.45	1.35	1.30	1.30
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60	1.35@1.45	1.15@1.25	1.05	.95@1.00	.....
Oakland, Calif.	1.75	1.75	1.75	1.75	1.75	1.75
Richmond, Calif.	.50*	.....	1.50*	1.50*	1.50*	.....
Spring Valley, Calif.	.70	1.55	1.50	1.40	1.35	1.35
Springfield, N. J.	2.10	2.10	2.00	1.75	1.60	1.60
Westfield, Mass.	.60	1.35	1.25	1.10	1.00	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Buffalo, N. Y.—Granite	.90	.....	1.20	1.00	1.05	1.10
Berlin, Utley and Red Granite, Wis.	1.50	1.60	1.40	1.30	1.30	.....
Columbia, S. C.—Granite	.....	.....	2.50	2.25	2.00	.....
Dundas, Ont.—Limestone	1.00	1.35	1.35	1.25	1.10	1.10
Eastern Penna.—Sandstone	.85	1.55	1.55	1.40	1.35	1.30
Eastern Penna.—Quartzite	1.20	1.30	1.20	1.20	1.20	1.20
Lithonia, Ga.—Granite	.90	1.75	1.75	1.40	1.40	1.00
Lohrville, Wis.—Cr. Granite	1.35	1.40	1.30	.....	1.20	.....
Middlebrook, Mo.—Granite	2.50@3.50	.....	2.00@2.25	2.00@2.25	.....	1.50
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Sioux Falls, S. D.—Granite	1.00	1.60	1.55	.....	1.50	.....

*Cubic yard. †Agrl. lime. ||R. R. ballast. §Flux. ‡Rip-rap, a 3-inch and less.

Agricultural Limestone

(Pulverized)

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.00; bulk **2.50**

Grove City, Pa.—Analysis, 97% $CaCO_3$—100% thru 20 mesh, 60% thru 100 mesh, 40% thru 200 mesh; in 80 lb. paper sacks, 4.50; bulk **3.00**

Hillsville, Pa. — Analysis, 96.25% $CaCO_3$; 75% thru 100 mesh; bulk 4.50

Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; 95% thru 50 mesh; bags, 4.00; bulk 2.50

New Castle, Pa.—89% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk **3.06**

Walford, Pa.—Analysis, 50% thru 100 mesh; 4.50 in paper; bulk **3.00**

West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.25—cloth, 4.75; bulk **3.00**

Alton, Ill.—Analysis, 97% $CaCO_3$, 0.1% $MgCO_3$—90% thru 100 mesh **6.00**
50% thru 50 mesh **4.00**

Bedford, Ind. — Analysis, 98.5% $CaCO_3$, .5% $MgCO_3$—90% thru 10 mesh **1.50**

Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk **2.50**

Chasco, Ill.—Analysis 96.12% $CaCO_3$, 2.5% $MgCO_3$; 90% thru 100 mesh 5.00
90% thru 50 mesh 1.35

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; sacks 4.50
Bulk 3.00

Milltown, Ind. — Analysis, 94.41% $CaCO_3$, 2.95% $MgCO_3$—33.6% thru 100 mesh, 40% thru 50 mesh ..... 1.25@1.65

Yellow Springs, Ohio—Aanlysis 96.08% $CaCO_3$, 63% $MgCO_3$, 32% thru 100 mesh; 95.57%, sacked, 6.00; bulk **4.25**

Hot Springs, N. C.—50% thru 100 mesh, sacks, 4.25; bulk **3.00**

Knoxville, Tenn.—80% thru 200 mesh 3.50
80% thru 100 mesh 2.70
(Bags extra 1.25 per ton)

Mountville, Va. — Analysis, 76.60% $CaCO_3$, 22.83% $MgCO_3$—50% thru 100 mesh; 100% thru 20 mesh; sacks 5.00

Colton, Calif.—Analysis, 95% $CaCO_3$, 3% $MgCO_3$—all thru 20 mesh—bulk 4.00

Agricultural Limestone

(Crushed)

Bellevue, Ohio — Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; ¼ in. to dust, about 20% thru 100 mesh **1.25**

Bettendorf, Ia., and Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$—50% thru 100 mesh; 50% thru 4 mesh 1.25

Buffalo, Ia.—90% thru 4 mesh **1.00**

Cape Girardeau, Mo. — Analysis, 93% $CaCO_3$, 3.3% $MgCO_3$—50% thru 100 mesh 1.50
90% thru 4 mesh, cu. yd. 1.35

Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$—90% thru 4 mesh **1.00**

Columbia, Ill., near East St. Louis—½-in. down ..... 1.25@1.80

Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh ..... 1.80@3.80

Elmhurst, Ill. — Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$—50% thru 50 mesh **1.25**

Greencastle, Ind. — Analysis, 98% $CaCO_3$—50% thru 50 mesh **2.00**

Kansas City, Mo.—50% thru 100 mesh **1.50**

Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh 1.20

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—90% thru 50 mesh 2.00

Mitchell, Ind. — Analysis, 97.65% $CaCO_3$, 1.76% $MgCO_3$, pulverized limestone 1.50

(Continued on next page)

Agricultural Limestone

(Continued from preceding page.)

Montrose, Ia.—90% thru 100 mesh	1.25
Narlo, Ohio—Analysis 56% $CaCO_3$, 43% $MgCO_3$, limestone screenings, 37% thru 100 mesh; 55% thru 50 mesh; 100% thru 4 mesh	1.50@2.00
Ohio (different points), 20% thru 100 mesh; bulk	1.25@1.50
Piqua, O.—90% thru 100	3.25@5.00
40% thru 100	1.75@2.00
100% thru 4	1.25
River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@1.40
Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ¼-in. mesh	1.30
Stone City, Ia.—Analysis, 98% $CaCO_3$ 50% thru 50 mesh	.75
Toledo, Ohio—¼-in. to dust, 20% thru 100 mesh	1.00
Waukesha, Wis.—No. 1 kiln dried	2.00
No. 2 Natural	1.75
Alderson, W. Virginia—Analysis 90% $CaCO_3$; 90% thru 50 mesh	1.75
Cape Girardeau, Mo. — Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$ — 50% thru 100 mesh	2.00
90% thru 4 mesh	1.50
Cartersville, Ga.—Analysis 66% $CaCO_3$, 33% $MgCO_3$—all passing 10 mesh	2.00
Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$—90% thru 100 mesh, 4.00; 50% thru 100 mesh, 3.00; 90% thru 50 mesh, 3.00; 50% thru 50 mesh, 2.75; 90% thru 4 mesh, 2.75; 50% thru 4 mesh	2.75
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$—90% thru 50 mesh	1.75
Ladds, Ga.—50% thru 50 mesh	2.00
Garnett, Okla.—Analysis, 80% $CaCO_3$, 3% $MgCo_3$; 50% thru 50 mesh	.50
Kansas City, Mo., Corrigan Sid'g—50% thru 100 mesh; bulk	1.80
Tulsa, Okla.—90% thru 4 mesh	.50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:	
Baltimore, Md.	2.25
Berkley Springs, W. Va.	2.00@ 2.25
Cedarville and South Vineland, N. J.—Damp, 1.75; dry	2.25
Cheshire, Mass.	5.00@10.00
Columbus, Ohio	2.00@ 2.50
Dunbar, Pa.	2.50
Falls Creek, Pa.	2.50
Hancock, Md.—Damp, 1.50; dry	2.00
Klondike and Pacific, Mo.	2.00@ 2.50
Mapleton, Pa.—Damp, 2.00; dry	2.75
Massillon, Ohio	3.00
Michigan City, Ind.	.50@ .55
Mineral Ridge, Ohio	2.50@ 2.75
Green	2.00
Montoursville, Pa.	1.75
Oregon, Ill.	1.25@ 2.00
Ottawa, Ill.	2.50
Pittsburgh, Pa.—Dry, 4.00; damp	3.00
Rockwood, Mich.	2.50
Round Top, Md.—Damp, 1.50; dry	2.00
Sands, Pa.	2.50
San Francisco, Cal.	3.00@ 3.50
St. Mary's, Pa.	2.25
Thayers, Pa.	2.00@ 2.50
Utica, Ill.	1.25@ 1.50
Zanesville, Ohio	2.00@ 2.50
FOUNDRY SAND:	
Albany, N. Y.—Sand blast	3.75
Molding fine and brass molding	2.50
Molding coarse	1.75
Allentown, Pa.—Core and molding fine	1.50@1.75
Arenzville and Greenville, Ill.—Molding fine	1.50@1.60
Molding coarse	1.50@1.75
Brass molding	2.00
Beach City, O. — Core, washed and screened	2.00@2.50
Furnace lining	2.50@3.00
Molding fine and coarse	2.25@2.50
Cheshire, Mass.—Furnace lining, molding, fine and coarse	5.00
Sand blast	5.00@8.00
Stone sawing	6.00
Cleveland, O.—Molding coarse	1.50@2.00
Brass molding	1.50@2.00
Molding fine	1.50@2.25
Core	1.25@1.50
Columbus, Ohio—Core	.50@2.00
Sand blast	3.50@5.00
Furnace lining	2.50@3.00
Molding fine	2.00@2.50
Molding coarse	1.75@2.00
Traction	.75@ .90
Brass molding	2.00@3.00

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Attica, N. Y.	.75	.75	.75	.60	.60	.60
Ambridge and So. Heights, Pa.	1.15	1.15	1.15	1.15	.70	.70
Buffalo, N. Y.	1.10	.95			.85	
Erie, Pa.		.60	.90		1.00	
Farmingdale, N. J.	.48	.48	.75	1.20	1.20	
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Leeds Junction, Me.		.50	1.75	1.35	1.35	1.25
Machias, N. Y.	.95	.95	1.25	.85	.85	.85
Pittsburgh, Pa.	1.15	1.15	1.15	.70	.70	.70
Portland, Maine		.50	1.75		1.35	1.35
Washington, D. C. (rewashed, river)	.75	.75	1.60	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.50	.40				.90
Barton, Wis.		.60	.70	.70	.70	.70
Beloit, Wis.		.70			.80	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.75	.75@1.00	.65@1.00	.75@1.00	.75@1.00	.75@1.00
Des Moines, Iowa	.60	.60	1.70	1.70	1.70	1.70
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.	.70		60-40 sieves, .85; Pebbles, .95			
Eau Claire, Wis.	40@ .50	.45	1.25			.90
Elkhart Lake, Wis.	.50	.40	.60	.50	.50	.50
Ft. Dodge, Ia.		1.22		2.17		
Grand Rapids, Mich.		.50		.80		.70
Greenville, Mechanicsburg, O.	.65	.65	.65	.65	.65	.65
Hamilton, Ohio		.90			.90	
Hawarden, Ia.		.50			1.60	
Hersey, Mich.	.40	.40			.70	
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Libertyville, Ill.		.50		.70		
Mankato, Minn.—Pit run	.50	.40	.40		1.25	
Mason City, Ia.	.65	.60		1.80	1.70	1.65
Mendota, Ill.	.60@1.05	.60@1.05	.60@1.05	.60@1.05	.60@1.05	.60@1.05
Milwaukee, Wis.	1.06	1.06	1.26	1.26	1.26	
Minneapolis, Minn.	.35	.35	1.25@1.35	1.25@1.35	1.25	1.25
Moline, Ill.	.70	.70	1.40	1.40	1.40	1.40
Riton, Wis.		.60			.80	
St. Louis, Mo., f.o.b. cars	1.20	1.45	1.65	1.45		1.45
St. Louis, Mo., delivered on job	2.05	2.20	2.35	2.15		2.10
Summit Grove, Clinton, Ind.	.65@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75
Terre Haute, Ind.	1.00	1.00	1.25	1.25	1.00	1.00
Waukesha, Wis.	.40	.40	.80	.80	.80	.80
Winona, Minn.	.40	.40	1.25	1.25	1.10	1.10
Yorkville, Sheridan, Moronts, Oregon, Ill.	.60	.50@ .70		.60@ .80	.50@ .70	.60
SOUTHERN:						
Alexandria, La.		.70			1.20@1.35	
Birmingham, Ala.	1.48		all gravel—1.88			
Charleston, W. Va.	1.40		1.50			
Estill Springs, Tenn.	1.35	1.15		1.00	.85	.65
Ft. Worth, Tex.	1.50@2.00	1.50@2.00	1.50@2.00	1.50@2.00	1.50@2.00	1.50@2.00
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	.75@1.00	1.00	1.00@1.50	1.00@1.50	1.00@1.50	1.00@1.50
Lake Weir, Fla.		60				
Macon, Ga.		.50@ .75				
Memphis, Tenn.	1.12	1.12				1.95
N. Martinsville, W. Va.		1.00	1.00	1.00	1.00	.80
New Orleans, La.		.50			1.00	
Pine Bluff, Ark.	1.20	.90	Washed gravel, all sizes, 2.25			
Roseland, La.	.25			.85		
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	80	80
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton. Missouri River, .85)					
Los Angeles, Calif.		.70		1.25		1.10
Pueblo, Colo.	1.10*	.90*			1.50	
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.15@1.45
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.00*	1.00*	1.00*	.85*	.85*	1.00*
Spring Valley, Calif.	.70	.80	1.40	1.35	1.25	1.25

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch	Sand, ¼ inch	Gravel, ½ inch	Gravel, 1 inch	Gravel, 1½ inch	Gravel, 2 inch
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo.			River sand, 1.00 per yd.			
Cherokee, Iowa			.80 per ton—1.20 washed			
Dudley, Ky. (Crushed Sand)	1.00	1.00		.90		
East Hartford, Conn.			.65 per cu. yd.			
Estill Springs, Tenn.						.85
Fishers, N. Y.		.50@ .65		.50@ .65		
Grand Rapids, Mich.						.50
Hamilton, Ohio			.45 per cu. yd. in pit			
Hartford, Conn.		1.00*				
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Lindsay, Tex.	.85@1.00					.55
Janesville, Wis.		.65			.65@ .75	
Pine Bluff, Ark.			Road gravel .50			
Rochester, N. Y.	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Roseland, La.		.75				
Saginaw, Mich., f.o.b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			60% gravel, 40% sand, 1.55			
Stuart Grove, Ind.	.50	.50	.50	.50	.50	.50
Waco, Tex.		.80		1.50		1.30
Winona, Minn.			Clean pit run .60			
York, Pa.		.95@1.10	(crushed rock sand)			

*Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	2.35	1.35	1.35	1.35	1.35	1.35	1.35
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.25	1.25
Eastern Pennsylvania and Northern New Jersey	2.00	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.00	.80	1.25	.90	.85	.80	.80
Erie, Pa.	2.35	1.35	1.35	1.35	1.35	1.35	1.35
Emporium, Pa.	2.35	1.35	1.35	1.35	1.35	1.35	1.35
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.00	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.			All sizes, 1.50, F. O. B. Chicago				
Detroit, Mich.			All sizes, 1.65, F. O. B. Detroit				
Ironton, O.	2.05	1.45	1.80	1.45	1.45	1.45	1.45
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.92	1.67	1.77	1.77	1.77	1.67	1.67
			(Any delivery in city except team track deliveries)				
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Steubenville, Lowellville and Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.		1.55		1.55	1.55	1.55	1.55
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton & Low Moor, Roanoke, Va.	2.50	1.00	1.00	1.25	1.25	1.15	1.05

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing Hydrate	Masons' Hydrate	Agricultural Hydrate	Chemical Hydrate	Ground Burnt Lime Blk.	Ground Burnt Lime Bags	Lump Lime Blk.	Lump Lime Bbl.
EASTERN								
Adams, Mass.			7.00				2.90	
Bellefontaine, Pa.			8.00	9.00	8.00		8.50	
Berkley, R. I.			12.00					2.30
Buffalo, N. Y.	11.50	10.00	10.00	12.00	8.00	10.00	8.50	1.60
Chaumont, N. Y.					2.50	4.00		
Lime Ridge, Pa.							5.00	
West Rutland, Vt.	13.50	12.00	7.50	13.50			10.00	
West Stockbridge, Mass.								2.25
Williamsport, Pa.			10.00			10.00	6.00	
York, Pa. (dealers' prices)		11.50	10.50	11.50			7.50	1.65*
Zylonite, Mass.	3.20d	2.90d	7.00					
CENTRAL:								
Delaware, Ohio	11.50	10.00	9.50	10.50			9.00	1.60
Gibsonburg, Ohio	11.50	10.00	10.00		8.00	10.00	7.00	
Huntington, Ind.	11.50	10.00	10.00				8.00	1.70*
Luckey, Ohio	11.50	10.00	10.00					
Marblehead, Ohio	11.50	10.00	10.00		8.00	10.00	8.50	1.60
Marion, Ohio		10.00	10.00					
Mitchell, Ind.		12.00	12.00	12.00	11.00		10.00	1.60
Sheboygan, Wis.								7.50d
White Rock, Ohio	11.50	10.00	10.00	11.00	8.00	10.00	8.50	1.60
Woodville, O. (dlrs.' price)	11.50a	10.00a	10.00a	11.00a			9.00	1.60
SOUTHERN:								
Erin, Tenn.							6.00	1.00
Karo, Va.							7.00	1.30
Knoxville, Tenn.	18.00	11.00@12.00		11.00@12.00	10.00	11.00	8.50	1.50
Ocala and Zuber, Fla.	12.00	11.50	11.50	14.00			12.00	1.60
Sherwood, Tenn.	12.00	11.00					8.50	1.50
Staunton, Va.					7.00	8.00	7.50b	1.40
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. Mex.							15.00	
San Francisco, Calif.	22.00	22.00	15.00	22.00			16.00	2.15*
Tehachapi, Calif.							13.00	2.00

‡100-lb. sacks; *180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; §Paper sacks. (a) 50-lb. paper bags; terms, 30 days net; 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice. (b) Burlap bags. (c) 200-lb. bbl. (d) 280-lb. bbl. net.

Miscellaneous Sands

(Continued from preceding page)

Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.15
Dresden, O.—Core and traction	1.00
Molding, fine and coarse	1.25
Brass molding	1.50
Dunbar, Pa.—Traction, damp	2.25
Dundee, O.—Glass, core, sand blast, traction	2.50
Molding fine, brass molding (plus 75c for winter loading)	2.00
Molding coarse (plus 75c for winter loading)	1.75
Eau Claire, Wis.—Core	1.00@1.25
Sand blast	3.10@3.60
Traction	.30@ .40
Falls Creek, Pa.—Molding, fine and coarse	1.75
Sand blast	2.00
Traction	1.75
Franklin, Pa.—Core	1.25@1.75
Furnace lining	2.50
Molding fine	2.00
Molding coarse	1.75
Brass molding	2.00
Greenville, Ill.—Molding coarse	1.30@1.50
Joliet, Ill.—Milled, dried and screened No. 2 coarse molding sand and open hearth loam and luting clay	.60@ .80
only)	.70
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn.—Stone sawing	1.30@1.50
Klondike, Pacific, Gray Summit, Mo.—Glass sand, furnace lining, molding coarse	2.00@2.50
Molding fine	2.00
Mapleton, Pa.—Glass, core, furnace lining, molding fine and coarse; damp 2.00, dry	2.75
Massillon, O.—Traction, molding fine and coarse, furnace lining, core	2.75
Michigan City, Ind.—Core, traction	.40@ .45
Mineral Ridge, Ohio—(Green) core	2.00
Furnace lining, molding fine and coarse, roofing, sand blast, stone sawing and traction, brass molding	2.00
Montoursville, Pa.—Core	1.25@1.35
Traction	1.00
Molding fine	1.50
Molding coarse	1.50@2.00
New Lexington, O.—Molding fine	2.00
Molding coarse	1.50
Oregon, Ill.—Core, furnace lining	1.25@2.00
Sand blast	3.00@4.50
Stone sawing	1.50@3.50
Brass molding	1.25@2.00
Ottawa, Ill.—Core, furnace lining, molding, steel, traction, roofing sand	2.00
Brass molding	3.00
Sand blast	3.50
Stone sawing	3.50
Ottawa, Minn.—All crude silica sand	.75@1.00
Pelzer, S. C.—Glass sand (carload lots	
Rockwood, Mich.—Core, damp	1.90
Roofing	2.75
Sand blast	3.75
Round Top, Md.—Glass sand	1.75@2.00
Core, furnace lining	1.45
Traction	1.60

(All per 2000 lbs.)

Miscellaneous Sands

(Continued)

San Francisco, Cal. (Washed and dried)—Core, molding fine, roofing sand and brass molding	3.00@3.50
Direct from pit.	
Furnace lining, molding coarse, sand blast	3.60
Stone sawing, traction	2.30
Thayers, Pa.—Core	2.00
Furnace lining	1.25
Molding fine and coarse	1.25
Traction	2.00
Utica, Ill.—Core	.75@1.25
Furnace lining	1.00@1.50
Molding fine, dry	1.25@1.50
Molding coarse, crude and dried	.75@1.50
Roofing sand	1.25@1.50
Stone sawing	1.25@2.50
Traction	1.50
Brass molding	1.25@1.50
Utica, Pa.—Core	1.25@2.25
Molding fine and coarse, traction, brass molding	2.00
Warwick, O.—Core, furnace lining, molding fine and coarse (damp, 1.75) dry	2.25
Traction, brass molding (dry)	2.00
Zanesville, Ohio—Core	2.00
Furnace lining	6.00
Molding fine	2.75
Molding coarse	2.50
Brass molding	3.00

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Ground talc (20-50 mesh), bags	10.00
Ground talc (150-200 mesh), bags	12.00
Cubes	50.00
Blanks (per lb.)	.07
Chatsworth, Ga., and Marshall, N. C.—Crude talc	4.00@ 4.50
Ground talc (20-50 mesh), bulk 6.50, bags	7.50
Ground talc (150-200 mesh), bulk 7.50@9.50, bags	8.50@12.50
Chester, Vt.—Crude talc	5.00
Ground talc (150-200 mesh), bulk	7.00@ 9.00
bags	8.00@10.00
Emeryville, N. Y.—200-325 mesh; bags	14.00@16.00
Glendale, Calif.—Ground talc (150-200-mesh)	16.00@30.00
(Bags extra)	
Ground talc (50-300 mesh)	13.50@15.50
200 mesh	13.50@14.50
Hailesboro, N. Y.—Ground talc (150-250 mesh), bags	18.00
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	3.00@ 3.50
Ground talc (20-50 mesh)	6.75@ 7.75
(150-200 mesh) bags	9.00@14.00
Johnson, Vt.—Ground talc (20-50 mesh), bulk 7.50; (150-200 mesh)	8.00@15.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags extra)	
Los Angeles, Calif.—Ground talc (200 mesh) (includ. bags)	16.00@20.00
Mertztown, Pa.—Ground talc (20-50 mesh); bulk 4.50, bags	5.50
(150-200 mesh); bulk 6.50, bags	7.50
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Vermont—Ground talc (20-50 mesh); bags	7.50@10.00
Ground talc (150-200 mesh); bags	8.50@15.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	7.50
(Bags 1.00 extra)	
Ground talc (150-200 mesh), bulk	9.00@14.00
(Bags 1.00 extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Rock Phosphate

Raw Rock

Per 2240-lb. Ton

Centerville, Tenn—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	6.00
Gordonsburg, Tenn.—B.P.L. 68%-72%	4.50@5.00
Tennessee—F. o. b. mines, long tons, unground Tenn. brown rock, 72% B. P. L.	7.00
Mt. Pleasant, Tenn.—Analysis, .70 B.P.L. (2000 lbs.)	6.50
Montpelier, Idaho—70% B.P.L.—Crude	4.75
Crushed 2-in. ring and dried	5.00
Paris, Idaho.—2,000 lb. mine run, B.P.L. 70%	4.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f. o. b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$10.20	$8.40	$8.10	$7.50
24x14	10.20	8.40	8.10	7.50
22x12	10.80	8.70	8.40	7.80
22x11	10.80	8.70	8.40	7.80
20x12	12.60	9.00	8.70	8.10
20x10	12.60	9.00	8.70	8.10
18x10	12.60	9.00	8.70	8.10
18x 9	12.60	9.00	8.70	8.10
16x10	12.60	8.70	8.40	7.80
16x 9	12.60	8.70	8.40	7.80
16x 8	12.60	8.70	8.40	7.80
18x12	12.60	9.00	8.70	8.10
16x12	12.60	8.70	8.40	7.80
14x10	11.10	8.40	8.10	7.50
14x 8	11.10	8.40	8.10	7.50
14x 7 to 12x6	9.30	8.10	7.50	7.50
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$8.10	$7.20	$5.75
22x11	8.40	8.40	7.50	5.75
Other sizes	8.70	8.70	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

Ground Rock

Wales, Tenn.—B.P.L. 70%, Per 2000-lb. Ton	7.75
Barton, Fla. — Analysis, 50% to 65% B.P.L.	3.50@8.00
Centerville, Tenn.—B.P.L. 65%	6.00
B.P.L. 75% (brown rock)	12.00
Columbia, Tenn.—B.P.L. 68% to 72%	5.50
B.P.L. 65% (90% thru 200 mesh) bulk	5.50
Morriston, Fla.—Analysis, 35% B.P.L.	12.00
Mt. Pleasant, Tenn.—B.P.L. 65%	5.50@6.00

Florida Soft Phosphate

Raw Land Pebble

Per Ton

Bartow and Norwills, Fla.—B.P.L. 50%, bulk	6.00@ 8.00
B.P.L. 78%, bulk	13.50
Florida—F. o. b. mines, long ton, 68/66% B.P.L.	3.00
68% (min.)	3.25
70% (min.)	3.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

Per Ton

Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Lakeland, Fla.—B.P.L. 60%	6.00
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	5.00@ 6.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	16.00@20.00	10.00@14.00
Slate granules		7.00@8.00
Granville, N. Y. — Red slate granules		7.50
Ingomar, Ohio	10.00@12.00	10.00@25.00
Lincoln, Neb. — Red, white, grey, in bags		30.00
granite; sacks	28.50@30.00	20.00@22.50
Marble chips, white, pink, creole, black		27.50
green		37.50
sparklets (bags extra)		50.00
Milwaukee, Wis.		20.00@30.00
New York, N. Y.—Red and yellow Verona		32.00
Middlebrook, Mo.—Red		25.00@30.00
Phillipsb'g, N. J.—Green stucco dash	16.00@20.00	14.00@18.00
Piqua, O.—Marble		7.00@ 9.00
Poultney, Vt. — Roofing granules		7.50
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.	12.00	
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b., bags 10c extra	5.00	5.00

Concrete Brick

Prices given per 1,000 brick, f. o. b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	20.00	25.00@35.00
Bellows Falls, Vt.	18.00	25.00@35.00
Birmingham, Ala.	15.00	30.00@40.00
Carpenterville, N. J.	20.00	36.00
Easton, Pa.	16.00	40.00@60.00
Eugene, Ore.	25.00@26.00	50.00@75.00
Friesland, Wis.	20.00	32.00
Houston, Tex.		19.50
Lockport, N. Y.	16.00	
Omaha, Neb.	18.00	30.00@40.00
Piqua, O.	15.00	25.00
Portland, Ore. (Del'd)	21.00	30.00@60.00
Puyallup, Wash.	20.00	30.00@75.00
Rapid City, S. D.	18.00	25.00@40.00
Rochester, N. Y.	21.00	
St. Paul, Minn.	15.00	30.00@35.00
Salem, Ore.	25.00	35.00@50.00
Salt Lake City, Utah	17.00@18.00	35.00@40.00
Seattle, Wash.	22.00	35.00@80.00
Springfield, Ill.	18.00	20.00@25.00
Tampa, Fla.	15.00	25.00@65.00
Wauwatosa, Wis.	14.00@15.00	33.00@75.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	7.00
Barton, Wis.	10.50
Boston, Mass.	13.00@14.00
Brighton, N. Y.	14.75
Buffalo, N. Y.	16.50
Dayton, Ohio	12.50@13.50
El Paso, Texas	12.00
Grand Rapids, Mich.	12.00
Lancaster, N. Y.	13.50
Michigan City, Ind.	11.00
Milwaukee, Wis.	14.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.	15.00
Redfield, Mass.	15.00
Rives Junction, Mich.	11.00
Saginaw, Mich.	11.00
San Antonio, Texas—Common	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	18.00
f.o.b. cars	14.00
Washington, D. C.	14.50
Winnipeg, Can.	18.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finishing	Hydrate per Ton Common
Atlanta, Ga.	23.00	13.00
Baltimore, Md.	21.00	15.75
Cincinnati, Ohio	14.80	12.30
Chicago, Ill.	20.00	18.00
Dallas, Tex.	25.00	.....
Denver, Colo.	24.00	.....
Detroit, Mich.	18.00	13.25
Kansas City, Mo.	25.60	24.00
Minneapolis, Minn. (white)	25.50	22.00
Montreal, Que.	21.00	21.00
New Orleans, La.	.....	17.25
New York, N. Y.	16.80	13.10
Philadelphia, Pa.	15.50	14.50
St. Louis, Mo.	21.20	19.00
San Francisco, Calif.	22.00	16.00
Seattle, Wash. (paper sacks)	24.00	.....

	Lump per 180-lb. Barrel (net) Finishing	Lump per 180-lb. Barrel (net) Common
Atlanta, Ga.	2.25†	1.85†
Baltimore, Md.	.....	15.00‡
Cincinnati, Ohio	.....	10.75‡
Chicago, Ill.	1.50†	1.40†
Dallas, Tex.	15.00‡	11.00‡
Denver, Colo.	.....	2.70†
Detroit, Mich.	.....	17.00‡
Kansas City, Mo.	2.34†	2.20†
Minneapolis, Minn.	1.70†	1.40†
Montreal	15.00‡	11.00‡
New Orleans, La.	2.40†	.....
New York, N. Y.	3.63½*	2.75@3.13½*
Philadelphia, Pa.	13.00‡	12.00‡
St. Louis, Mo.	.....	17.75‡
San Francisco, Calif.	.....	1.75†
Seattle, Wash.	2.80†	.....

*Per 280 lb. bbl. (net). †Per 180-lb. bbl. (net). ‡Per ton. Refund of 10c per bbl. Minneapolis quotes brown common lump lime: Kelly Island white is $1.55, Sheboygan $1.45. New York quotes hydrated lime "on cars" in paper sacks; lump lime "alongside dealers' docks" or "on cars."

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags.

Atlanta, Ga.	2.80
Boston, Mass.	3.03
Cedar Rapids, Iowa	2.45
Cincinnati, Ohio	2.51
Cleveland, Ohio	2.46
Chicago, Ill.	2.20
Dallas, Tex.	2.25
Davenport, Iowa	2.43
Denver, Colo.	2.65
Detroit, Mich.	2.47
Duluth, Minn.	2.14
Indianapolis, Ind.	2.41
Kansas City, Mo.	2.45
Los Angeles, Calif.	3.06
Milwaukee, Wis.	2.37
Minneapolis, Minn.	2.39
Montreal, Can. (sacks 20c extra)	2.40
New Orleans, La.	2.83
New York, N. Y.	2.70
Pittsburgh, Pa.	2.24
Portland, Ore.	3.05
St. Louis, Mo.	2.35
San Francisco, Calif.	2.63
St. Paul, Minn.	2.39
Toledo, Ohio	2.48
Seattle, Wash.	2.90

NOTE—Add 40c per bbl. for bags.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White§ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board—1/2x32x36" Weight 1500 lb. Per M Sq. Ft.	Plaster Board—3/8x32x36" Weight 1850 lb. Per M Sq. Ft.	Wallboard, 1/2x32 or 48" Lengths 6'-10', 1850 lb. Per M Sq. Ft.
Douglas, Ariz.	.....	.....	5.00	7.50	8.50	.....	.....	.....	.....	.....	.....	.....	.....
Fort Dodge, Iowa	3.00	3.50	6.00	8.00	10.00	10.50	20.00	.....	21.30	20.00	20.00	.....	30.00
Garbutt, N. Y.	.....	.....	6.00	8.00	10.00	10.00	.....	7.00	.....	.....	.....	20.00	.....
Grand Rapids, Mich.	3.00	.....	7.00	10.00	10.00	10.00	.....	.....	31.05	.....	20.00	21.00	30.00
Hanover, Mont.	4.50	.....	6.00	10.00	.....	10.50	.....	.....	.....	.....	.....	.....	.....
Mound House, Nev.	.....	8.50	6.50	10.50@11.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	30.75	21.00	19.375	20.00	30.00
Rapid City, S. D.	4.00	.....	.....	10.00	12.00	12.50	.....	.....	33.75	.....	.....	.....	.....
Winnipeg, Man.	5.50	5.50	7.00	13.50	15.00	15.00	.....	.....	.....	.....	28.50	.....	35.00

NOTE—Returnable Jute Bags, 15c each, $3.00 per ton; Paper Bags, $1.00 per ton extra.
*Shipment in bulk 25c per ton less; ‡Bond plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton additional; ||Bulk; (a) Includes sacks.

News of All the Industry

Sand and Gravel

The Shepherd Sand and Gravel Co., Shepherd, Tenn., has increased its capital from $13,000 to $40,000.

The Missouri River Sand and Gravel Co., Booneville, Mo., is putting in all-steel equipment on its derricks, substituting metal for all wood parts.

Kelso, Wash.—Karl Hays plans the erection of a sand and gravel plant including a washing plant. The gravel will be taken from the river with a dragline system.

North Hempstead, N. Y.—W. F. Fleming will operate a sand and gravel plant on the Hempstead Harbor shore, and will furnish sand and gravel for road construction.

The Wabash Sand and Gravel Co., Clinton, Ind., is working full force day and night in order to keep up with orders, and is shipping from 10 to 20 cars a day of sand used for roads and building construction.

Stockton, Calif.—The Sledge mine, owned by Messrs Elson and Rynne, San Francisco, is being developed at a rapid rate and the work of driving an adit to tap the subterranean gravel channel has begun.

The Standard Sand and Gravel Co., Wheeling, W. Va., which began operations August 1, report an excellent business for that period. The company operates a dredge with a 2000-ton capacity between Pittsburgh and Cincinnati, its digging frame will work 50 ft. below the surface. The crane boat used for unloading has a 10-ton lifting capacity, capable of unloading 1000 tons a day. The boat is equipped with an 80-hp. gasoline engine and is capable of towing 1000 tons of sand and gravel. A 15-ton steel crane and concrete storage bins with a 1000-ton capacity each of sand and gravel is now being erected. When completed the equipment will be capable of taking care of 18 cars of sand and gravel daily. Walter Armstrong is president and Edgar Aaron, secretary and treasurer.

Cement

The Monarch Cement Co., Humboldt, Kans., has recently opened offices at 805 Mayo building in charge of J. P. Thompson.

The Marquette Cement Manufacturing Co., Chicago, Ill., is preparing for the erection of a $100,000 storage plant in West Davenport this winter.

The Southwestern Portland Cement Co., El Paso, Texas, is operating at full capacity according to a statement by H. E. Nichols, assistant superintendent. The entire output is being shipped.

The Monolith Portland Cement Co., Monolith, Calif., is planning on the addition of a large cement kiln. Other extensive new equipment is being added by the company to increase the production and volume of its plant.

Chattanooga, Tenn.—Construction at the new plant of the Signal Mountain Cement Co. is progressing rapidly, several units being more than 50 per cent complete. Due to the delay caused by the railroad strike the $300,000 plant will not be in operation until the latter part of February, 1923.

The Texas Portland Cement Co., Dallas, Texas, set off a blast of one ton of dynamite caving in a huge wall of rock at its quarries as a special attraction for 75 members of the Dallas Purchasing Agents Association, who were guests of R. H. Miers, purchasing agent of the cement company and president of the association, on a tour of inspection through the plant.

Manufacturers

The Austin Machinery Corp. has consolidated the main sales office at Chicago with its engineering and production departments at 3500 Dorr Street, Toledo, Ohio. This is just one more step, says the company, toward the unification of its affairs to increase service in all its branches. It lends dispatch to the handling of orders for both machines and repairs. It is believed that it will be of mutual benefit to both the Austin organization and its many customers. However, a branch sales office will be maintained at Chicago, Suite 603 Railway Exchange building, for the convenience of contractors in and near Chicago.

Quarries

The Charles Warner Co. and **The American Lime and Stone Co.** announce the removal of their Philadelphia offices from the Finance building to 607 Morris building, 1421 Chestnut street.

Birmingham, Ala.—The stone quarries at Trinity, Ala., owned by Mrs. Lilly R. Nelson, Decatur, Ala., may be reopened after being idle 30 years. According to experts the quarries contain a limestone rock which is one of the best building and construction stones known.

The J. Hoadley and Sons Stone Co., Bloomington, Ind., due to extensive building construction and the demand for crushed stone, will install a tramway 150 ft. long and contemplate other additions to its plant, also plans for another tramway 100 ft. long are being drawn up. The company ships about 15 carloads of stone daily, and will probably operate all through the winter.

Lime

The Warrior Lime and Stone Co., Huntingdon, Pa., is experiencing a shortage of labor and is unable to work at full capacity.

The Cambria Iron and Steel Co.'s limestone quarries will build three additional storage tracks, large storage bins and five large steam shovels to take the place of man power, and 28 carloads of graded limestone will be shipped daily to the steel plant at Johnstown.

The Gouverneur Limestone Co.'s new plant at Gouverneur, N. Y., is nearing completion. The greater part of the machinery, including the machinery in the old plant, together with new apparatus, has been installed and the mill will soon be in readiness for operation.

The Pacific Limestone Products Co., Oakland, Calif., has purchased the property of W. Caplatzi, consisting of 14 acres of limestone. Improvements and new machinery will be installed to carry on operations. The owners are F. W. Johnston, Santa Cruz, Dora L. Martin, Berkeley, and W. D. Johnson, San Francisco.

Personal

Howard Rhode has been promoted to the position of manager of the Lehigh Portland Cement Co., Allentown, Pa. Mr. Rhode was formerly advertising manager of the company. H. M. Eichelberger succeeds Mr. Rhode in this position.

Samuel L. Barnes, secretary of the Superior Portland Cement Co., Seattle, Wash., has been appointed a member of the Dartmouth University alumni council. He is a member of the graduating class of 1908.

Harry Filer, Jr., manager of the Grove City Limestone Co., has left for a trip around the world. He expects to be gone five months and will visit Africa, Asia and all of Europe, as well as Japan and other isles off coast of continents.

W. W. Sayers of the Link-Belt Co., Chicago, has been promoted to the position of chief engineer of the company's Philadelphia works and Eastern operations. For many years Mr. Sayers was a representative of the company in the Chicago territory in the lines related to power house machinery, coal storage, Peck carriers, crushers, etc., and later in charge of the locomotive crane department. His headquarters will be at the Philadelphia office for the present.

Frank M. Williams, who is completing his fifth year as State Engineer of New York state, announces that he has joined the Technical Advisory Corporation, consulting engineers, 132 Nassau, New York City. He will be one of the corporation's active principals and will specialize in advising on matters pertaining to the development of water powers, canal construction, highway and pavement construction, the valuation of public utilities and the development of railway and marine terminals.

Trade Literature

Chains—The Brown Hoisting Machinery Co., Cleveland, Ohio, has a new catalog—Catalog "L"—on its drop-forged chain for conveyors and elevators.

Ditching Machinery—"Topping, the Pony-Ditcher," is the title given a 24-page catalog recently issued by the Charles T. Topping Machinery Co., Pittsburgh. The catalog gives descriptions and examples of the ditcher in action.

Steam Shovels—In its Bulletin No. 304 the Marion Steam Shovel Co., Marion, Ohio, illustrates and describes its new 1¼-yd. shovel, Model 37. The bulletin contains a full description of the machine, its purposes, and the uses to which it can be put.

Locomotives—The Adamson Motor Co., Birmingham, Ala., has issued an illustrated folder describing its attachment for the Fordson tractor which enables it to run on rails. The folder is complete with specifications, data and information covering the equipment.

Gasoline and Kerosene Engines—The Climax Engineering Co., Clinton, Iowa, has recently issued Bulletin 1001, showing the uses of its engines. The illustrations are of engines installed in tractors, cranes, ditchers, locomotives, steam shovels, air compressors and as stationary installations.

Sifters—Catalog 77 of the Orville Simpson Co., 1230 Knowlton street, Cincinnati, has 18 pages of illustrated matter describing its sifter. It shows a diagrammatic representation of the cloth cleaning system together with the basic features of the sifter. A long list of the materials which can be sifted are also given.

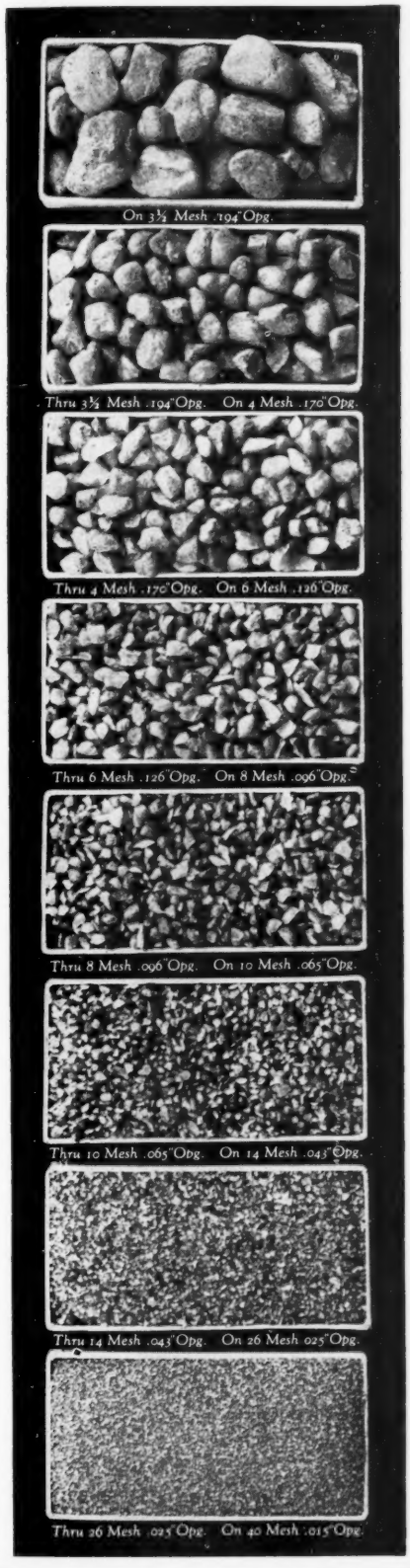
Hydrating Machinery—The Kritzer Co., Chicago, has issued a 12-page booklet that deals almost entirely with lime rather than with the company's product itself. It begins with the history of lime, and gives much data and general information regarding its manufacture. The booklet is illustrated with drawings and photographs.

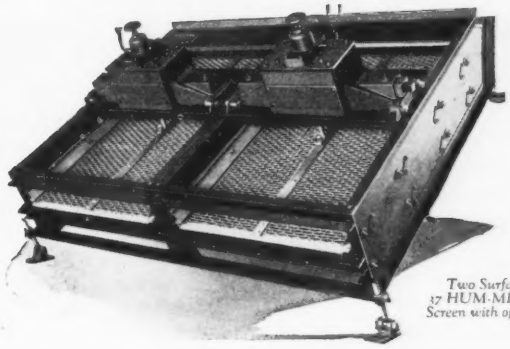
Railroad Ties—Bulletin No. 24 has been sent out by the Century Wood Preserving Co., Pittsburgh, describing the treatment given its products. It contains illustrations of the methods employed in treating timber and reasons why preserved ties and timbers should be used in preference to those not treated. The bulletin contains tables showing the cubical contents of all sizes of ties, poles and piling.

Refractories—The Refractories Manufacturers' Association, 840 Oliver building, Pittsburgh, has just published the fourth edition of its booklet, "Brands of Fire Brick and other Refractories." It announces that "The booklet is not an advertisement. It lists the brands used by practically all of the manufacturers of refractory brick and is particularly useful to a man who knows the brand he wants to use, but who doesn't know who makes it. A copy will be sent gratis on receipt of written request."

"The Opening is the Thing" is the slogan of the recent folder issued by the Ludlow-Saylor Wire Co., St. Louis. It is devoted to the decimal openings of wire screens manufactured by this company. A long table of decimal equivalents accompanies some 25 actual-size illustrations of screens; determination of sizes; purpose of classification; proportions allowable, grinding equipment; accesibility of surface for replacement, and other features. A reproduction from the company's Catalog 46 shows a page of decimal openings from 1-in. to 100-mesh.

Look At These Separations





Two Surface Type 37 HUM-MER Electric Screen with open bottom

CLOSE GRADING!

What is screening, but a process of measuring and sorting immense quantities of particles to a given size?

The HUM-MER Electric Screen, in combining accuracy and thorough separation with volume of output, excels any other existing screening device.

The HUM-MER is not only handling larger tonnages per sq. ft. of area than any other screen, it also produces a sharp, clean separation of the material.

Note the sharp separations in the samples of silica produced with the HUM-MER! Note the freedom of each size from particles of finer size! Here is a character of sorting action that is enabling many producers to save and earn thousands of dollars over other means of separation.

Any division of material between 2½-inch diameter and 200 mesh can be made with HUM-MER Electric Screens.

Investigate this remarkable screening process! Let us demonstrate by tests with samples of your material what it would do for you!

Catalogue 45-R will be sent to you upon request.

THE W. S. TYLER COMPANY

CLEVELAND, OHIO

Manufacturers of

Woven Wire Screens and Screening Equipment

Buyers' Directory
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AERIAL TRAMWAYS
Interstate Equip. Co., New York, N. Y.

AUTOMATIC WEIGHERS
Richardson Scale Co., Passaic, N. J.
Schaffer Eng. & Equipment Co., Pittsburgh, Pa.

BAGS AND BAG MACHINERY
Jaite Co., The, Jaite, Ohio

BELTING
Robins Conveying Belt Co., New York City, N. Y.

BINS
Austin Mfg. Co., Chicago, Ill.
Blaw-Knox Co., Pittsburgh, Pa.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Easton Car & Constr. Co., Easton, Pa.
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill. (storage).

BIN GATES
Allis-Calmers Mfg. Co., Milwaukee, Wis.
Austin Mfg. Co., Chicago, Ill.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Easton Car & Constr. Co., Easton, Pa.
Link-Belt Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

BLASTING SUPPLIES
Grasselli Powder Co., Cleveland, Ohio.

BOILERS, WASTE HEAT
Edge Moor Iron Co., Edge Moor, Del.
Freeman Mfg. Co., Racine, Wis.

BUCKETS—Elevator
Austin Mfg. Co., Chicago, Ill.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Haiss Mfg. Co., The Geo., New York City, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., Chicago, Ill.
Orton & Steinbrenner, Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.

BUCKETS, GRAB
Blaw-Knox Co., Pittsburgh, Pa.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Haiss Mfg. Co., The Geo., New York City, N. Y.
McMyler Interstate Co., Cleveland, Ohio.

CABLEWAYS
Flory Mfg. Co., S., Bangor, Pa.
Interstate Equip Co., New York, N. Y.
Link-Belt Co., Chicago, Ill.

CALCINING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J. B., Enterprise, Kans.

CARS—Quarry and Industrial
Atlas Car & Mfg. Co., Cleveland, Ohio.
Easton Car & Construction Co., Easton, Pa.
Ottumwa Iron Works, Ottumwa, Iowa.
Watt Mining Car Wheel Co., Barnesville, Ohio.

CAR PULLERS
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

CEMENT MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.

CHAIN
Morse Chain Co., Ithaca, N. Y.

CLUTCHES
Webster Mfg. Co., Chicago, Ill.

CONVEYORS AND ELEVATORS
Haiss Mfg. Co., The Geo., New York City, N. Y.
Jeffrey Mfg. Co., Columbus, Ohio.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Robins Conveying Belt Co., New York City.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., Chicago, Ill.

CRANES—Locomotive Gantry
Brown Hoisting Machinery Co., The, Cleveland, Ohio.
Byers Mach. Co., The, Ravenna, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Link-Belt Co., Chicago, Ill.
McMyler-Interstate Co., Cleveland, Ohio.
Ohio Locomotive Crane Co., Bucyrus, Ohio.
Orton & Steinbrenner, Chicago, Ill.
Osgood Co., The, Marion, Ohio.

CRUSHERS AND PULVERIZERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulverizer Co., St. Louis, Mo.
Austin Mfg. Co., Chicago, Ill.
Austin-Western Road Mach. Co., Chicago, Ill.
Buchanan Co., Inc., C. G., New York, N. Y.
Butterworth & Lowe, Grand Rapids, Mich.
Chalmers & Williams, Chicago Heights, Ill.
Jeffrey Mfg. Co., Columbus, Ohio.
K. B. Pulverizer Co., New York, N. Y.
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Kent Mill Co., Brooklyn, N. Y.
Lewistown Fdry. & Mach. Co., Lewistown, Pa.
McLanahan-Stone Mach. Co., Hollidaysburg, Pa.
Munson Mill Machinery Co., Utica, N. Y.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Crusher Co., Cedar Rapids, Iowa.
Universal Road Mach. Co., Kingston, N. Y.
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.

CRUSHER REPAIRS—Manganese Steel
American Manganese Steel Co., Chicago Heights, Ill.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

CLUTCHES
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

DERRICKS
American Hoist & Derrick Co., St. Paul, Minn.
Mundy Hoisting Engine Co., J. S., Newark, N. J.

DIPPER TEETH
American Manganese Steel Co., Chicago Heights, Ill.

DREDGING MACHINERY
Flory Mfg. Co., S., Bangor, Pa.

DRILLS
Sanderson Cyclone Drill Co., Orrville, Ohio.

DRILLERS
Pennsylvania Drilling Co., Pittsburgh, Pa.

DRYERS
American Process Co., New York City.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

DUST COLLECTING SYSTEMS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DYNAMITE
Grasselli Powder Co., Cleveland, Ohio.

ENGINES—Steam
Morris Mach. Works, Baldwinsville, N. Y.

ENGINEERS
Buckbee Co., J. C., Chicago, Ill.
Ehrsam & Sons Co., J. B., Enterprise, Kans.
Hunt, R. W., & Co., Chicago, Ill.
Richard K. Meade & Co., Baltimore, Md.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Webster Mfg. Co., Chicago, Ill.

EXCAVATORS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Erie Steam Shovel Co., Erie, Pa.

EXCAVATORS—Dragline Cableway
Link-Belt Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

EXPLOSIVES
Grasselli Powder Co., Cleveland, Ohio.

GAS PRODUCERS
Morgan Construction Co., Worcester, Mass.

GEARS
Cleveland Worm & Gear Co. Cleveland Ohio.
Link-Belt Co., Chicago, Ill.

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(Continued from page 56)

GLASS SAND EQUIPMENT
Lewistown Fdy. & Mach. Co., Lewistown, Pa.

GRINDING MILLS
Munson Mill Machinery Co., Utica, N. Y.

HOISTS
American Hoist & Derrick Co., St. Paul, Minn.
Austin Mfg. Co., Chicago, Ill.
Flory Mfg. Co., S., Bangor, Pa.
Link-Belt Co., Chicago, Ill.
Ottumwa Iron Works, Ottumwa, Iowa.
Thomas Elevator Co., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

HOSE
Robins Conveying Belt Co., New York City, N. Y.

HYDRATING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio
Kritzer Co., The, Chicago, Ill.
Miscampbell, H., Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Toepfer & Sons Co., W., Milwaukee, Wis.

HYDRAULIC DREDGES
Morris Machine Works, Baldwinsville, N. Y.

LIME HANDLING EQUIPMENT
Link-Belt Co., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

LIME KILNS
Blaw-Knox Co., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

LOADERS AND UNLOADERS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Haiss Mfg. Co., The Geo., New York City, N. Y.
Jeffrey Mfg. Co., Columbus, Ohio.
Link-Belt Co., Chicago, Ill.
Orton & Steinbrenner, Chicago, Ill.

LOCOMOTIVES
Baldwin Locomotive Works, The, Philadelphia, Pa.
Fate-Root-Heath Co., Plymouth, Ohio.
Hadfield-Penfield Steel Co., Bucyrus, Ohio.
Jeffrey Mfg. Co., Columbus, Ohio.
Lima Locomotive Works, New York, N. Y.
Vulcan Iron Works, Wilkes-Barre, Pa.
Whitcomb Co., Geo. D., Rochelle, Ill.

MANGANESE STEEL
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

MOTOR TRUCKS
Traylor Eng. & Mfg. Co., Allentown, Pa.

PAINT AND COATINGS
Williams, C. K., & Co., Eaton, Pa.

PERFORATED METALS
Cross Eng. Co., Carbondale, Pa.
Hendrick Mfg. Co., Carbondale, Pa.

PLASTER MACHINERY
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J. B., Enterprise, Kans.

PORTABLE CONVEYORS
Haiss Mfg. Co., The Geo., New York City, N. Y.
Link-Belt Co., Chicago, Ill.

POWDER
Grasselli Powder Co., Cleveland, Ohio.

POWER TRANSMITTING MACHINERY
Link-Belt Co., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Manganese Steel Co., Chicago Heights, Ill.
Morris Machine Works, Baldwinsville, N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.

PULLEYS
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

PULVERIZED FUEL EQUIPMENT
Raymond Bros. Impact Pulv. Co., Chicago, Ill.

QUARRY EQUIPMENT
Universal Road Mach. Co., Kingston, N. Y.

RAIL CLAMPS
McDermid Positive Rail Clamp Co., Chicago, Ill.

ROAD MACHINERY
Austin-Western Road Mach. Co., Chicago, Ill.

ROPE, WIRE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.

SCALES
Richardson Scale Co., Passaic, N. J.

SCRAPERS, DRAG
Link-Belt Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

SCREENS
Austin Mfg. Co., Chicago, Ill.
Austin-Western Road Mach. Co., Chicago, Ill.
Cross Eng. Co., Carbondale, Pa.
Haiss Mfg. Co., The Geo., New York City, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Twin City Iron & Wire Co., St. Paul, Minn.
Tyler Co., The, W. S., Cleveland, Ohio.
Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SEPARATORS
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Tyler Co., The W. S., Cleveland, Ohio.

SEPARATORS, MAGNETIC
Buchanan Co., C. G., Inc., New York, N. Y.

SHEAVES
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SHOVELS—Steam, Electric and Gas
Brown Hoisting Machinery Co., Cleveland, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Hoar Shovel Co., Duluth, Minn.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., The, Marion, Ohio.

SPROCKETS
Link-Belt Co., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SPROCKET CHAIN
Webster Mfg. Co., Chicago, Ill.

STEEL PLATE CONSTRUCTION
Blaw-Knox Co., Pittsburgh, Pa.
Hendrick Mfg. Co., Carbondale, Pa.

STORAGE BINS
Austin Mfg. Co., Chicago, Ill.
Austin-Western Road Mach. Co., Chicago, Ill.
Brown Hoisting Machinery Co., Cleveland, Ohio.

STUCCO FACINGS
Metro-Nite Co., Milwaukee, Wis.

SWITCHES AND FROGS
Central Frog & Switch Co., Cincinnati, Ohio.

TANKS, STEEL STORAGE
Blaw-Knox Co., Pittsburgh, Pa.
Traylor Eng. & Mfg. Co., Allentown, Pa.

TESTING SIEVES AND TESTING SIEVE SHAKERS
Tyler Co., The W. S., Cleveland, Ohio.

TRAMWAYS
Interstate Equip. Co., New York, N. Y.

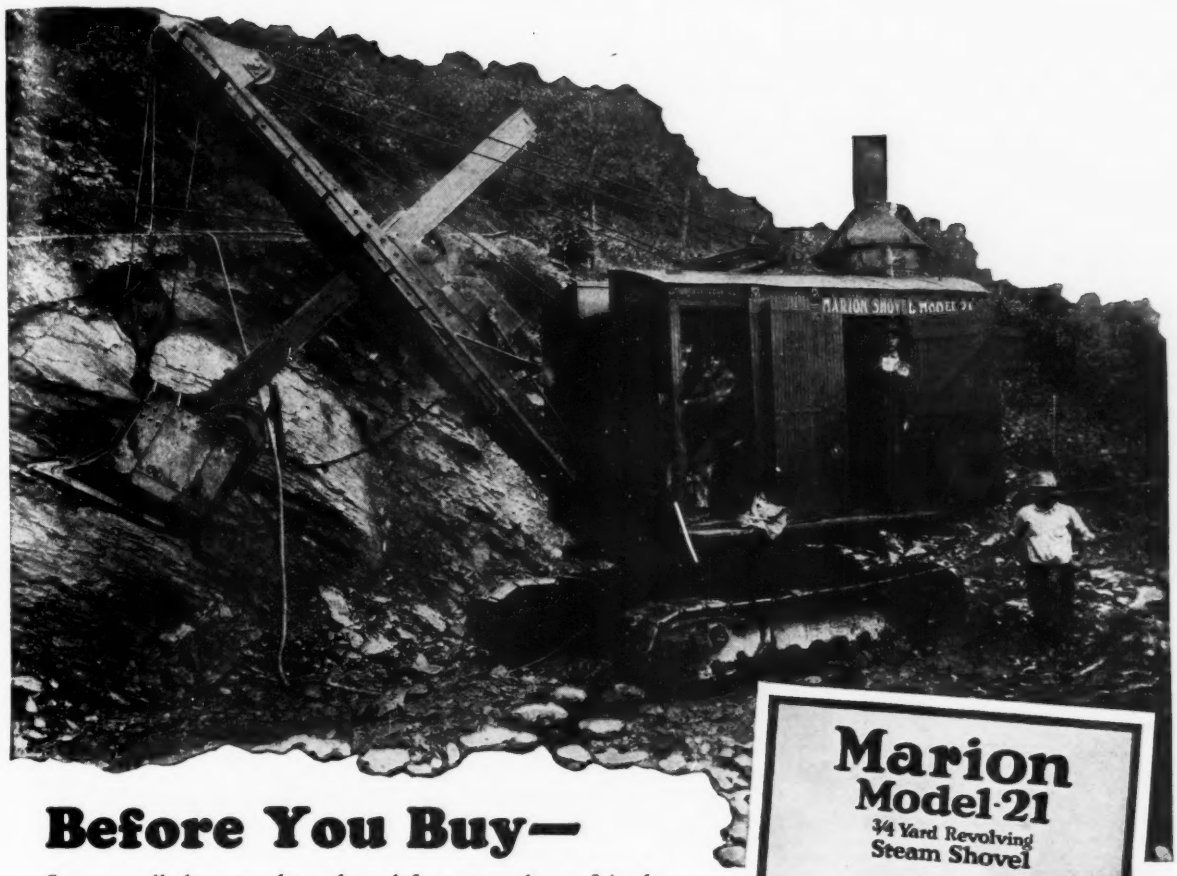
TRANSMISSION MACHINERY
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

WASHERS, SAND AND GRAVEL
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.

WEIGHING EQUIPMENT
Richardson Scale Co., Passaic, N. J.

WIRE ROPE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.

WIRE CLOTH
Cleveland Wire Cloth Co., Cleveland, Ohio.
Twin City Iron & Wire Co., St. Paul, Minn.
Tyler Co., The W. S., Cleveland, Ohio.



Before You Buy—

Sum up all that you have heard for years about ¾-yd. revolving shovels—steam, gasoline or electric.

Consider carefully the many features of design that have been submitted for your consideration.

Compare construction, performance or maintenance—any one or all of these qualities.

Weigh every argument carefully.

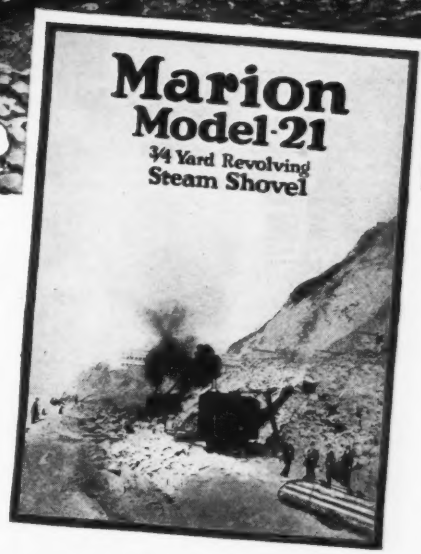
Then check each item with the new Marion 21—the most highly perfected shovel in the ¾-yd. class.

See one of these shovels at work and you'll be convinced—

That the essential qualities of Power, Speed, Capacity and Endurance are built into this new Shovel in a most surprising and striking manner.

That every claim of action and ability is abundantly substantiated.

That it surpasses all other ¾-yd shovels in quality and performance, making it the *best buy on the market today.*



SEND for Bulletin No. 305 just off the press and get complete information on the New 21. It shows by actual illustrations and data why the New 21 has:

More Power
Wider Range of Usefulness
Better Materials
Finer Workmanship
Easier Steering.

269

The Marion Steam Shovel Company

Marion Ohio.

Marion Crawler Trucks Make Hard Going Easy

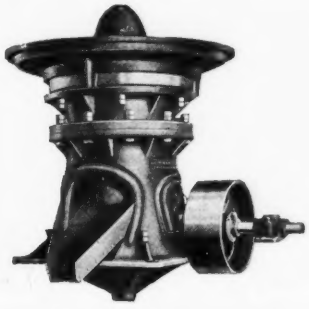
AUSTIN GYRATORY CRUSHERS

Stationary and Portable Types

Austin equipment in your crushing plant will solve your most difficult production problems. Austin Crushers have features found in no others, while Austin Elevators, Screens, Cars and other accessories are in a class with the crushers.

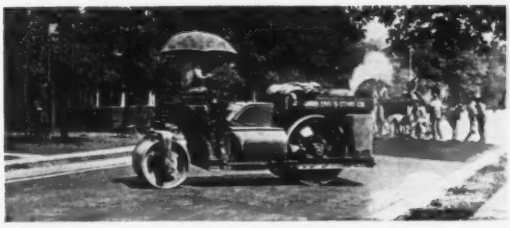
Maximum output with minimum delay is the combination responsible for the remarkable operating records made by Austin equipped plants.

Crusher Catalog 29-T tells the whole story. Drop us a card and we'll send you one by return mail.



AUSTIN MANUFACTURING CO.

New York Chicago San Francisco



Hours Have 60 Minutes Once More

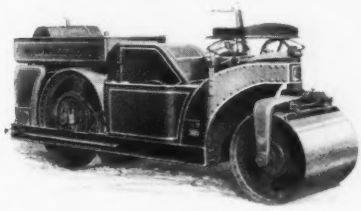
with an Austin Tandem Motor Roller on the job

All steam tandems are "off duty" at least 15 minutes out of every working hour in the day. The engineer spends that much time fussing with his fire and water.

Add to this item the time spent getting up steam and banking fires, and it isn't hard to understand why Austin Tandems have made operating records that no steam tandem can touch.

The motor tandem shines especially brightly on patch work, as it can be started and stopped at a moment's notice and is "off expense" entirely when idle.

Other features of real value, such as ease of handling and low center of gravity, which result in more and better work, are fully described in the latest Austin Roller Catalog FT. Write for a copy.



THE AUSTIN-WESTERN ROAD MACHINERY CO.

CHICAGO

Branches in 22 Cities

"Everything from a Drag Scraper to a Road Roller"

"Baby Steam Shovel"

The greatest cost of underground operation is hand shoveling. Not only is the cost excessive, but efficient labor is hard to find. Then there are the large rocks, the expense of overseeing gangs, and the larger the gang, the greater the cost in insurance and liability.

We have solved the problem of providing a shovel that will operate economically on the power available underground. It is a machine built on the same general plan of the time tested steam shovel, but uses air for power underground. It is quick, flexible, adaptable to digging in any direction, is rugged and strong, and capable of standing much abuse.

The Hoar Underground Shovel

has held a loading average of 150 one-ton cars per eight hour shift, in very hard digging, handling chunks as large as 1500 lbs., and can easily maintain an average of 200 tons per shift in softer material.

It will trim or spot its own cars, moving itself forward or backward to the extent necessary for operation, and will handle any kind of material, loose sand, mud, gravel or rock up to a half-ton boulder.

It can be used with profit in many surface operations where the cost of a large steam shovel would be prohibitive.

Write for complete information

THE HOAR SHOVEL COMPANY, INC.

214 Sellwood Building **Duluth, Minnesota**

A Haiss "Creeper" Truck Loader

is the logical choice for road building and quarry work

Logical because it does more work at less cost—and earns a greater profit on the investment it represents. This is more than an opinion; it is borne out by the experience of users all over the country. And the equipment has a longer life and a greater salvage value than less substantial machinery.

A Haiss Loader is the **only** machine which combines the three motions essential to fully efficient loading. It **loads** itself, **feeds** itself and **crowds** into the pile at a slow speed **simultaneously.** Only one operator and not a shovel anywhere. Every bucket digs a full load—watch them.

Let us tell you of the actual results others have obtained —it may point the way to saving you money. Or ask us who is using Haiss Equipment right near you—and make your own inquiries. You'll want Bulletin 521, too.

The Geo. Haiss Mfg. Co., Inc.

Established 1892

139th St. and Park Ave., New York

Representatives throughout the world

Millar's Timber & Trading Co., London, British Representatives

Osgood Steam Shovels

produce results thru long service, speed, and ease of operation.

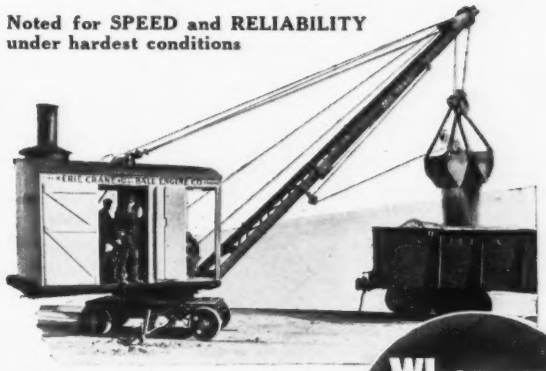
Whether you need a large Railroad Type or small Revolving Shovel, with Crane, Clamshell or Dragline attachments, the same speed, snap and steady productivity will be found in each of them.

Revolving Types, ¾ and 1 cu. yd.
Railroad Types, 1½ to 6 cu. yd.

Booth 228—Good Roads Show—Jan. 15-19

OSGOOD Company
Marion, Ohio, U. S. A.

Noted for SPEED and RELIABILITY under hardest conditions



When you need extra output

This machine saves you money even when it is working at only one-fourth capacity, and replacing only 10 or 12 men—

And when you have ***rush orders,*** and are working your plant to the limit, your ERIE Crane can give results like these:

"We loaded 300 tons of sand in 2 hrs. and 10 mins., digging 3 to 8 ft. below track level. This time included moving from car to car.

"This is too speedy, but we wanted to know what our ERIE Crane can do."—W. B. Manny, President. Hoosier Slide Sand Co., Michigan City, Ind.

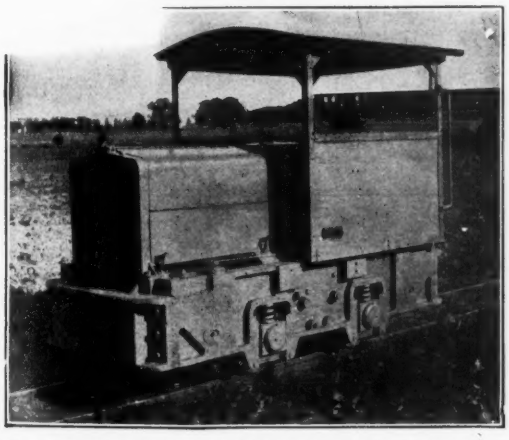
Every ERIE Crane can be quickly and easily changed to steam shovel.

Let us send full description of the ERIE Crane. Write for Bulletin P-30.

Erie Steam Shovel Co., Erie, Pa., U. S. A.
Builders of ERIE Steam Shovels and Locomotive Cranes

ERIE Revolving Shovels

WHITCOMB LOCOMOTIVES



QUARRIES—CEMENT PLANTS—BRICK PLANTS

The success of Whitcomb locomotives in hundreds of plants speaks of their thoroughness of design and construction and dependability in time of need. We would be glad to tell you what they are doing for others.

Whitcomb locomotives are designed to work and built to overwork

WRITE TODAY FOR BULLETINS

GEO. D. WHITCOMB COMPANY
Rochelle, Ill., U. S. A.

Flirting With the Shovels

In the game of crushed stone quarrying a drill that is within flirting distance with steam shovel or the loading gangs is in a dangerous position. A breakdown on the drill, and the whole production schedule is upset.

No. 14 Cyclone Drills, on the job, always keep plenty of stone ahead, and if they should ever be crowded there is no need for worry—the working parts are cast steel, reducing to the very minimum all possibility of breakdowns.

Write for "Big Blast Hole Drills," a semi-technical treatise on quarry drilling and also containing a complete description of Cyclone No. 14 Big Blast Hole Drills.

The Sanderson-Cyclone Drill Co.
Orrville, Ohio

Eastern and Export Office: 30 Church Street, New York City

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25′, 3½ x25′, 4x30′, 5½x50′, 6x60′ and 7x60′; double shell dryers, 4x20′, 5x30′ and 6x35′; steam-heated air rotary dryers, 4x30′ and 6x30′.

KILNS—Rotary kilns, 4x40′, 5x50′ and 6x70′, 6x100′, 7x80′ and 8x110′.

MILLS—6x8′, 6x5′, 5x4′, 3x3½′ pebble and ball mills; 3′ March mill; 42″, 33″ and 24″ Fuller-Lehigh mills; 4½x20′, 5x11′, 5x20′, 5½x22′ and 6x20′ tube mills; 7½x13″, 9x15″, 16x10″ and 12x26″ jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 24″, 36″ and 40″ cage mills; 3′ and 4½′, 6′ and 8′ Hardinge mills; 18x12″, 20x12″ and 30x10″ roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 5 roll and 2 roll No. 1 and No. 000, No. 00 and No. 0 Raymond mills; one No. 3 and No. 4 and No. 7½ Telsmith breaker; one 36″ Sturtevant emery mill; one 3 roll Griffin mill; 60″ chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; 6x8′, 6x5′ and 4x3′ Newaygo vibrating screens; Richardson automatic scales; 8′ and 10′ Emerick air separators.

Air compressors.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

DEPENDABLE SERVICE

Hyman-Michaels Co.

531 Peoples Gas Bldg., Chicago, Ill.

RELAYING RAILS AND ANGLE BARS

In All Weights, 30 to 100 Lb. to the Yd.

Quick Shipment
Dependable Service

Get Our Quotations Today

We Also Cut Rails to Lengths for Props, Etc.

OFFICES AT
New York City, 1324 Woolworth Bldg.
Pittsburgh, Pa., 1312 1st Nat'l Bank Bldg.
St. Louis, Mo., 2115 Railway Ex. Bldg.

1—50-ton standard gauge Brooks 6-wheel switcher.
1—39-ton standard gauge Baldwin 6-wheel switcher with separate tender.
1—42-ton standard gauge Shay geared locomotive.
1—12x18″ standard gauge 4-wheel saddle tank.
1—9-ton 36″ gauge 4-wheel saddle tank.
1—23-ton new 36″ gauge Porter 6-wheeler with tender.
10—5-ton 36″ gauge storage battery locomotives.
1—14-B Bucyrus steam shovel, mounted on traction wheels.

Birmingham Rail & Locomotive Co.
Birmingham, Ala.

FOR SALE

2—8x110′ Rotary Kilns.
5—5x6x7x110′ Rotary Kilns.
5—5x21′ Tube Mills (1 has Silax lining, 3 steel lining, 1 without lining).
1—4′ 6″x40′ Coal Dryer.
2—No. 6 Gates Crushers.
3—5½x22′ Tube Mills.
2—6x50′ Rotary Dryers.
3—Kominuters.
6—Krupp Ball Mills.
3—33″ Fuller Mills.
2—6x60′ Rotary Dryers.

ENGINEERING SALES COMPANY, Nashville, Tenn.
OLLIE LAWRENCE, Stockertown, Pa.

IMMEDIATE DELIVERY
Send Us Your Steam Shovel Inquiries

66x86 in. TRAYLOR JAW CRUSHER.
No. 18K GATES CRUSHER.
25-50-80-110 HP. Elec. Hoists.
Nos. 4-5-6-7½ and 9 CRUSHERS.
6 & 12 ton gasoline locomotives.
NEW—1469 ft. SULLIVAN COMP., 2-STAGE, $1900.
2 DISC CRUSHERS, 36 & 24 in. SYMONS.
100-ton 2½ yd. ELECTRIC SHOVEL.
Columbus Portable Conveyor, 25 ft. Eng. drive.
50 to 5000 ft. Steam, Belt, Elec. drive Comp.
JAW AND ROLL CRUSHERS.
10-15 and 20 ton Locomotive Cranes.
13x30 in., 10x18 in., 9x14 in. JAW CRUSHERS.
NEW—1000 GPM. 100 lb. Cent. Pump, Motor Dr.
1000 GPM. UNDERWRITERS STEAM PUMP—Prac. New.
24x54 McLANAHAN ROLL CRUSHER.
Send us your inquiries for Steam Engines, Cent. Pumps, Quarry and Contrs. Equip., etc.

ROSS POWER EQUIPMENT CO.
Indianapolis, Ind.

FOR SALE

Unused Emerson Brantingham Double Cylinder Single Drum **Hoists** in first-class condition, f.o.b. Chicago, **$100** each. Immediate shipment. Full specifications furnished on application.

Hyman-Michaels Company
Peoples Gas Bldg. Chicago

FOR RENT AND SALE

14—4-yd. 36-in. ga. heavy duty Western dump cars.
20—12-yd. Western air dump cars, std. gauge.
50—60,000-lb. capacity flat and box cars.
1—Western standard gauge spreader, used sixty days.
1—Osgood 18 revolving shovel, traction wheels, No. 794, ¾-yd. bucket, built 1920.
1—Marion 76 steam shovel, No. 3503, std. gauge, weight 110 tons, used 10 months.
1—Class 14 Bucyrus dragline on caterpillars, 70-ft. boom, 2-yd. bucket, built 1921.
2—Foote 40-S 1-yd. side discharge concrete mixers, with steam engine and boiler.
32—NEW 20-in. I beams, 80 lbs. per foot, 40 feet long, not drilled.
1—NEW Lakewood concrete chuting system.

LOCOMOTIVES

1—50-ton 18x24-in. six-wheel switcher.
1—40-ton 17x24 in. four-wheel switcher.
2—NEW 24-ton six-wheel Porters, separate tender, 36-in. gauge.
2—18, 14 and 10-ton Vulcans, 36-in. gauge.

INDUSTRIAL EQUIPMENT CO.
McCormick Building Chicago, Illinois

FOR SALE
Centrifugal Pump

Manufactured by the Allis-Chalmers Mfg. Company

1—3 inch three stage horizontal split casing centrifugal pump with base plate and coupling direct connected to 1 50 HP., 1750 REV., 3 phase, 60 cycle, 2200 volt squirrel cage motor complete with potential starter having overload relay and undervoltage release. Practically new and in first class condition.

Marquette Stone Products Co.
McGregor, Iowa

Have you a plant for sale? Do you wish to purchase a plant? Are you in need of a superintendent or manager? Are you looking for a position as plant superintendent or manager? Advertise your wants in these columns for quick results.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid for in advance of insertion.

Telephone Court 4508-4509

H. R. EICHER

608-609 Maloney Bldg. Pittsburgh, Penna.

We have purchased from the Consolidation Coal Co. and the Cumberland & Pennsylvania R. R. Co. all of their Surplus Equipment. In this lot we have listed below some of the items and equipment that might be of interest to you at a very low figure. This material is all in A-1 condition, mechanically and otherwise, and will be loaded f. o. b. Frostburg, Md., and can be inspected at that point. Detailed specification on any item obtainable at our Pittsburgh office.

1—Norwalk 3-stage Air Compressor, straight line with intercoolers; steam pressure 125 lb.; air pressure 900 lb.; capacity 750 cu. ft. at 85 R.P.M.
1—Ingersoll Duplex Cooper-Corliss, steam pressure 125 lb.; air pressure 900 lb.; capacity 1409 cu. ft. free air at 80 R.P.M.
1—Ingersoll Duplex Cooper-Corliss 3-stage with intercooler; steam pressure 125 lb.; air pressure 900 lb.; capacity 800 cu. ft. at 90 R.P.M.
1—Ingersoll-Sargeant straight line; steam pressure 125 lb.; air pressure 150 lb.; capacity 1442 cu. ft. at 80 R.P.M.
1—Ingersoll straight line; steam pressure 125 lb. air pressure 150 lb.; capacity 382 cu. ft. at 100 R.P.M.
1—Rand straight line, steam pressure 125 lb.; air pressure 150 lb.; capacity 380 cu. ft. free air per minute at 125 R.P.M.
2—Ingersoll-Rand Imperial Type 10, capacity 1319 cu. ft. per minute; piston displacement at 150 R.P.M.; complete with 1-KY General Electric 200 H.P. Motor 3-phase, 60 cycle, 220 volts; 600 R.P.M. with C. R. 1034-H3 Compensator base and pulley 24x32x5; also complete with Air Receivers, Gauges, Fittings, etc.
1—Ingersoll-Rand Class J-2 single acting 2-stage 24¼x14¼x 18 in.; capacity 1000 cu. ft.; maximum pressure 100 lb. at 135 R.P.M.; complete with 1-200 H.P. Westinghouse Motor 3-phase, 60 cycle, 220 volts with slide rails, pulley and starting device; also 1-55-ft. 21-in. 2-ply Endless Leather Belt; complete with Air Receivers, Gauges, Fittings, etc.
3—Air Receivers, 30-in. dia. x 20 ft. long, tested 1000 lb. pressure.
1—Air Receiver, 60 in. dia. x 14 ft. long, tested 150 lb. pressure.
1—Air Receiver, 30 in. dia. x 6 ft. long, tested 150 lb. pressure.
1—150 H.P. Butt strapped triple riveted H. R. T. Boiler, complete with stacks, fronts, fittings, buck-stays, etc.
2—125 H.P. H. R. T. Boilers, complete, same as above.
2—Westinghouse Standard Steam Engines, 7½x7 in., 350 R.P.M., 20 H.P.
1—Case Steam Engine, 8 H.P., pulley 18 in. x 6¼ face, flywheels 18x5½, 648 R.P.M.
1—110 K.W. Allis-Chalmers A.C. Generator, 2200 volts, 225 R.P.M. direct connected to Harrisburg steam engine 16x 14, 150 H.P., 225 R.P.M.
2—150 K.W. Westinghouse D.C. Generators, 250-275 volts, 550 R.P.M.
1—160 H.P. Buckeye Generator Engine, 18x18¾, pulley 90 in. x 26 in., 200 R.P.M.
1—Westinghouse stand. engine, 7½x7 in., 350 R.P.M., 125 lb. pressure direct connected to 15 K.W. Wood Generator, type MPL Compound wound, 350 R.P.M. 125 volts, complete with switchboard, instruments, main line switches, fuses, etc.
1—7x10 Single Drum double cylinder Mine Hoist; drum dia. 40 in., face 40 in.
1—Double Drum Haulage Hoisting Engine; drums set side by side; 10x12, 40 in. drum dia., 40 in. face, flange 4½ in; levers banked.
1—H. K. Porter Air Locomotive, 6 wheel, 16 ton, 36 in. gauge.
1—Baldwin Air Locomotive, 6 wheel, 16 ton, 36 in. gauge.
1—H. K. Porter Air Locomotive, 6 wheel, 15 ton, 36 in. gauge.
1—Baldwin Compound Locomotive, 10 ton, 36 in. gauge.
4—Baldwin Gathering Locomotives, 4 ton, 36 in. gauge.
1—Cameron special Plunger Pump.
1—No. 3 Cameron Plunger Pump.
3—No. 9 Cameron Plunger Pumps, all bronze ends.
1—Cameron Boiler Feed Pump, 300 H.P.
1—Boiler Feed Duplex Pump, 7x4x10.
2—MacGowan Pressure Pumps, 6x10-5 in. suction, 4 in. discharge.
1—8-ft. Cast Iron Sheave; 1 5-ft. C. I. Sheave; 1 42-in. Cast Iron Sheave.
1—Storage Oil Tank, 8 ft. diameter, 30 ft. long.
1—Lot Steel Shafting ranging from 2 in. to 10 in. in diameter.
1—Lot Forged and Nickeled Steel, including some case hardened material in lengths from 4 ft. to 20 ft.
1—Miscellaneous lot of Pipe, Pipe Fittings, High and Low Pressure Valves, etc.

FOR SALE

Located at Nashville, Tenn.

1 4'x16' Tube Mill.
2 6'x60' Rotary Dryers.
1 6'x6'x12' Steel Hopper, Double Spout.
1 5'x5' Single Drum Hoist.
2 No. 3 Williams Mills.
2 15'x35' Steel Storage Tanks.
1 9'x15' Round Steel Hopper with legs.
9 1¾ yard, 36" gauge, Koppel All Steel Cars.
3 15 H.P. General Electric Motors.
1 40 H.P. General Electric Motor.
1 Sturtevant No. 2 Duplex Ring Roll Mill.
Steel Trusses and Columns.
10 Acre Manufacturing Site with R. R. Siding in property.

Engineering Sales Company **Nashville, Tenn.**

FOR SALE

1—48-inch Symons Disc Crusher—Manganese fitted, in good running order; also new spare parts to the value of about $1000.

This crusher has broken less than 50,000 tons of rock and is in first-class shape. Can be inspected at Richard Mine, Wharton, N. J. Reasonably priced. For full particulars address:

The Thomas Iron Company
Hokendauqua, Penna.

For Sale—Cheap

One Chicago Pneumatic Tool Co., Class N-502 Stationary Type Fuel Oil Driven Compressor, and Ingersoll-Rand Drill, D-24 Type. Subject to inspection at our Elsberry, Mo., quarry.

CRYSTAL CARBONATE LIME CO.
Louisiana, Missouri

For Sale—STEAM SHOVEL

⅝ YD. THEW "O" TRACTION

Thoroughly rebuilt; attractive terms for quick sale.

Walter A. Zelnicker Supply Co., St. Louis
Rails, Locomotives, Cars, Tanks, Pipe

WANTED

6'x16" or 6'x22" Hardinge Conical Mill, with scoop feed. Stone-lined with charge of pebbles. Want used mill but must be in good condition

Address Box 1598, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid for in advance of insertion.

Rebuilt Equipment

29—2 yd. Western 36" gauge cars.
3—9x14, 36" gauge Vulcan Locomotives.
10—30 H.P. Thomas Electric Hoists.
1—50 H.P. Thomas Electric Hoist.

Pittsburgh Machinery & Equipment Co.
Fulton Bldg., Pittsburgh, Pa.

QUARRY EQUIPMENT

4—20 yd. Steel Underframe Side Dump Cars.
3—16 yd. Steel Underframe Western Dump Cars.
10—1½ yd. Western Dump Cars.
2—10x16 Davenport 36 in. ga. Saddle Tanks.
1—11x16 American 36 in. ga. Saddle Tank.
1—9x14 Porter 4 ft. 8½ in. ga. Saddle Tank.
1—⅝ yd. Thew "O" Traction Shovel.

Walter A. Zelnicker Supply Co., St. Louis

Mine Cars, Rails and Ties

We have mine cars in stock for all purposes. Also rails 12 lb. to 100 lb. section. Spikes, bolts, frogs and switches. All trade is solicited and prices cheerfully quoted.

M. K. FRANK
Frick Building Pittsburgh, Pa.

Classified Advertising

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid for in advance of insertion.

WANTED

A good Cement Mill Superintendent who is familiar with the design and construction of a Cement Plant and the operation of same using the Wet Process. Must be competent to take full charge of building the plant and operating after completion. Would prefer a man who has had engineering experience as well as practical operating. In replying, give full details of experience in the Cement business, together with any recommendations you can furnish. Also state age and whether married or single and what salary expected. All correspondence will be kept strictly confidential. Address

Box No. 297, Zanesville, Ohio

FOR SALE

Sand and gravel plant located in New England near a city of nearly 150,000 population, with daily capacity of 500 yards. Fully equipped and now operating, with yard for storage within city limits. Trolley freight connection on improved highway. All assets, including accounts receivable, sold except cash on hand. Personal investigation solicited. Sale December 4, 1922, to the highest bidder. For full particulars address or wire

Box 1601, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

WANTED

A first-class Engineer who is thoroughly acquainted with designing and building a Portland Cement Plant using the Wet Process. A good place for a competent man. All correspondence will be kept strictly confidential. Address

Box No. 297, Zanesville, Ohio

General Superintendent Wanted

We want a man to take charge of our four quarries. Must have considerable experience in construction work, blasting, stripping and repair work and be familiar with steam shovels and large crushing plants.

We want a man who is looking for a permanent connection and good wages will be paid to the right party.

THE WAGNER QUARRIES CO.
Schmidt Bldg. Sandusky, Ohio

WANTED

Position as superintendent of lime plant. Now employed in that capacity but desire change. Guarantee efficiency and economy. Familiar with most all make kilns, fuel and hydration, also quarry. Can handle your plant from quarry to finished product on car. Would consider a foremanship of any department where ability will promote. Prefer to locate in either Pennsylvania or Ohio. Address

Box 1604, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

Sand Plant Engineer

for permanent position in small town; must be strictly sober and reliable. In answering, state experience, salary expected and references.

WINFIELD SAND COMPANY
Oliver Building Pittsburgh, Pa.

FOR SALE
All or Interest in

300 acres hard limestone land, with 1500x30 ft. open quarry face. Large new, crushing and screening, plant of 3000 tons daily capacity; centrally located to large demand for material; orders amounting to $200,000 on our books.

Capable man with $25,000 up, and knowledge of business can make big money, if act promptly.

Location in Southwest.

Box 1603, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

George Borrowman, Ph.D.
CHEMIST

Analyses, consultations, researches in connection with rock products, cements, clays, lime, plasters, zeolites, sands, etc.

9 So. Clinton St. Chicago, Ill.

H. E. WIEDEMANN
(Est. 1905)
Consulting and Analytical Chemist

Specialist in Analysis of Rock Products

Chemical Bldg. St. Louis

WANTED

To lease or purchase—going lime plant with hydrating equipment in Eastern or Southeastern States. Reply with some details, plant and quarry equipment. Preference given, White Magnesium Lime. Address

Box 1602, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

INDEX TO ADVERTISEMENTS